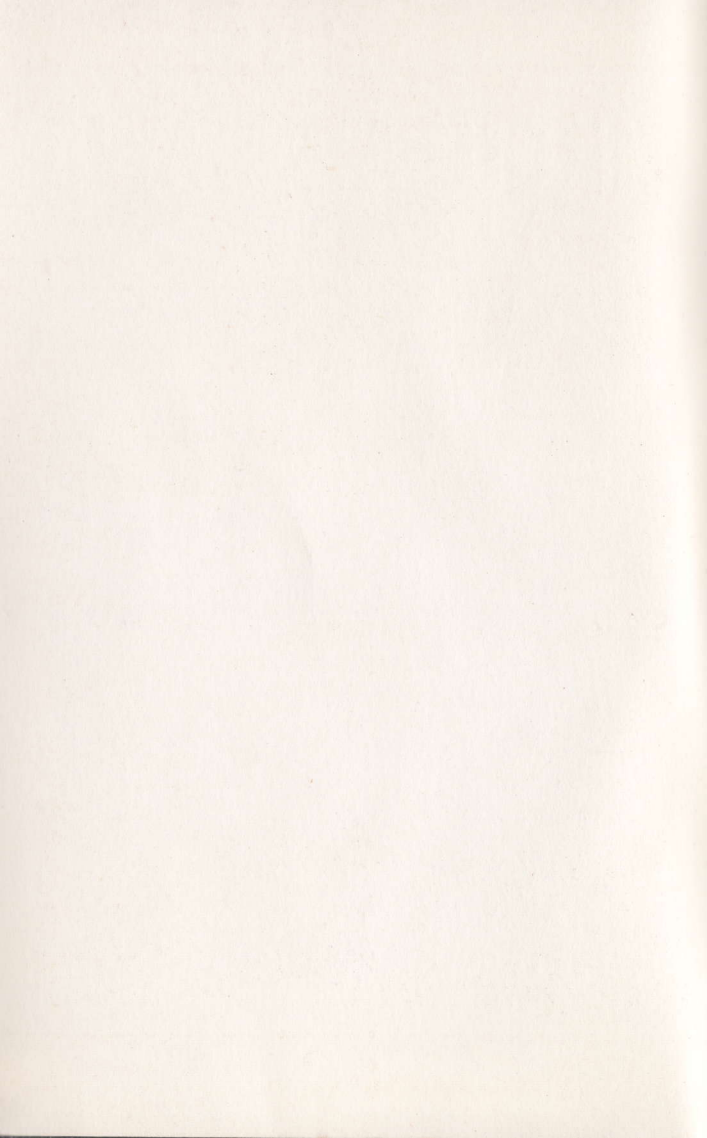


CARE *and* USE of CIRCULAR SAWS

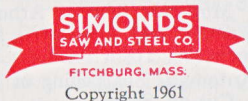
in Woodworking Plants



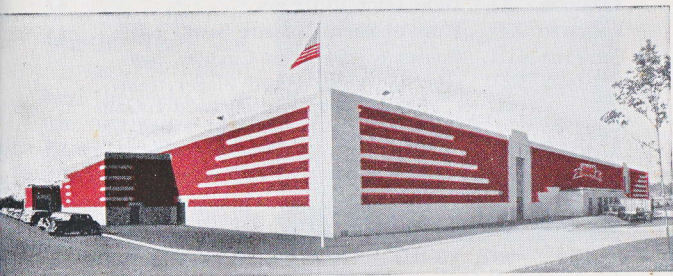
SIMONDS
SAW AND STEEL CO.



The Care and Use of Circular Saws in Woodworking Plants



Simonds Saw and Steel Company
"Makers of Fine Cutting Tools"
Fitchburg, Massachusetts



SIMONDS WORLD FAMOUS "CONTROLLED CONDITIONS" PLANT

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CHAPTER I

CIRCULAR SAWS

Circular Saws for cutting wood are made in all sizes from 4 inches to 84 inches, rarely larger. The "size" of a Circular Saw is its diameter in inches.

Circular saws in the larger diameters are mainly used in saw mills for sawing logs into lumber. A discussion of these larger circular saws is omitted here. Those who wish information about them should write for Simonds' book "The Circular Saw."

The smaller diameter Circular Saws which we discuss in this book are Cut-off Saws, Rip Saws, Planer Saws, Combination Saws, Smooth Trimmer Saws, Dado Saws, Dado Heads, Glue Joint Rip Saws and Mitre Saws. These are used in Planing Mills, Furniture Factories and Woodworking Shops. These various types of saws are illustrated and described on the following pages.

Cut-off Saws

Cut-off saws are used for squaring or trimming to length. They cut across the grain and the teeth have an alternate face bevel or shear to enable them to sever the wood fibers.



Cut-off Saw



Rip Saw

Rip Saws

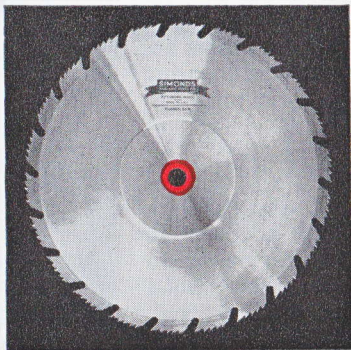
Rip saws cut with the grain and the teeth act as a series of small chisels. They are used in greater quantities and for a greater variety of purposes than any other type of circular saw.

Combination Saws

Combination saws are so named because they will cross cut, mitre and rip. Combination saws are made in five types:—The Planer Saw (Hollow Ground), No. 54, No. 52, No. 60 (All Flat Ground), and No. 66 Ply-wood (Clearance Ground.)

Planer Saws

This is a hollow ground smooth cutting combination saw. It will cut off, mitre and rip smooth enough to eliminate sanding and will stand fast hand feed



Planer Saw

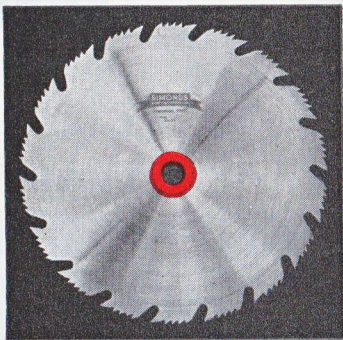
without gumming or overheating. Our latest improvement of giving the cutting teeth and raker more hook, makes the Simonds Planer saw the fastest smooth-cutting combination saw on the market. It is made only in standard gauges with four cutting teeth and one raker or cleaner tooth per section.

No. 54 Flat Ground Combination Saw

formerly known as

No. 54 Flat Ground Novelty Saw

This flat ground combination saw is very similar to the planer saw except that it is flat ground and the teeth are set for clearance. It has four cutting teeth and one raker or cleaner tooth per section. This type of saw is used very successfully on double end tenoners for trimming to length.



No. 54 Flat Ground Combination Saw

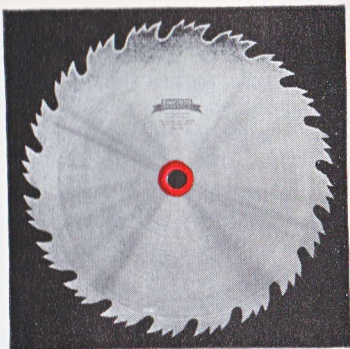
No. 52 Flat Ground Combination Saw

formerly known as

No. 52 Flat Ground Novelty Saw

This combination saw also has the teeth set for clearance and has two cutting teeth and one raker

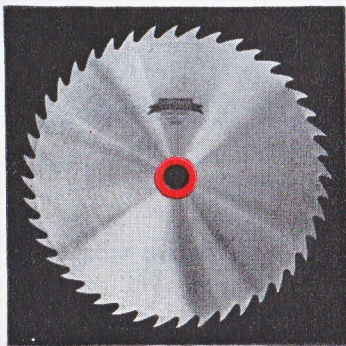
or cleaner tooth per section. Having fewer teeth than the No. 54, it is a faster cutting saw. This type of saw is used extensively on Dewalt and similar types of machines where one saw is required to rip, cut-off and mitre.



No. 52 Flat Ground Combination Saw

No. 60 Combination Saw

Our No. 60 Combination Saw resembles a rip saw somewhat but the teeth have less hook and are beveled to cut with and across the grain. It will not cut as smoothly as the No. 52 or No. 54 Flat Ground Combination Saws but will cut faster and is easier to sharpen. This is a popular saw on electric hand saw machines.



*No 60 Flat Ground
Combination Saw*

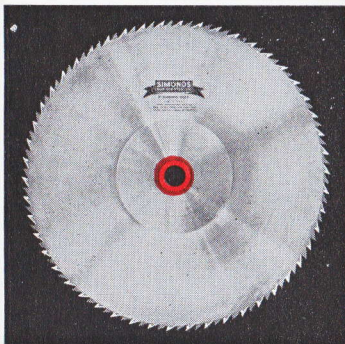
No. 66 Plywood Combination Saw



Trims or cuts off plywood smoothly *across the grain* without splinters or slivers on the top or bottom. Rips and mitres plywood so smoothly that no further finishing is necessary. Clearance ground two full gauges on each side to insure easy feeding, no binding. For fast hand feed use on table, radial arm and swing saws.

Smooth Trimmer Saws

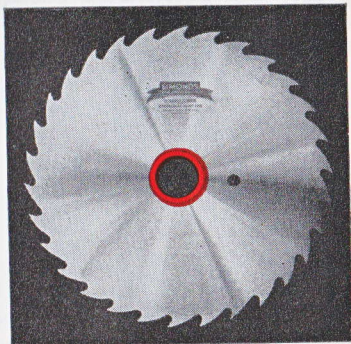
Smooth Trimmer saws are hollow ground cut-off saws especially designed for cutting off and trimming smoothly. The teeth have a 45° face bevel and when the saw is revolving at speed these teeth act like small knives and actually plane the ends of the lumber while cutting off.



Smooth Trimmer Saw

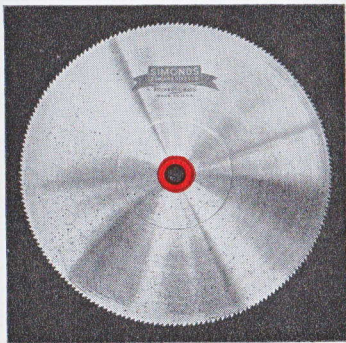
Glue Joint Rip Saws

Glue Joint Rip saws are heavy gauge rip saws for use on straight line or self feed rip machines. They are required to cut smoothly enough to make glue joints direct from the saw.



Glue Joint Rip Saw

Mitre Saws



Mitre Saw

Mitre Saws are used principally for smooth, clean cutting off and mitreing on light stock such as cabinet and cigar box work. They are hollow ground and made in diameters from 6" to 16".

Dado Heads

To cut smooth clean grooves in any direction of the wood. Made up of two outside Dado Saws and a number of inside fillers determined by the width of groove desired. Saws accurately scarfed for clearance. Fillers uniformly swaged and jointed.



Dado Head

Good saw performance is essential for maximum economical production and the object of this book is to help you, the user, attain this by giving you information on the proper care and sharpening of Circular Saws.

A circular saw should cut cleanly and easily and should not require an unreasonable amount of force to feed the wood. The continued operation of a dull saw because changing it will temporarily stop production or is a bother, means decreased output and puts a great strain on the saw and upon the machine. Saws with too heavy a set which cut an excessive saw kerf and saws with an uneven set which cut very rough, are two more examples of avoidable waste.

There are many factors that contribute to efficient sawing. The true running of the saw arbor and the collars, the shape and spacing of the teeth and careful sharpening, all require attention if good sawing is to be obtained. Any defect in the running of the arbor and collars will be magnified at the rim and cause a rough cut. The collars should be accurately machined and balanced and the faces of the collars should be square to the axis of the arbor, the arbor perfectly straight with no end-play and the bearings tight.

How to Check Bearings

With the machine stopped, grasp the end of the saw arbor with both hands. If you can move the arbor up and down or in and out slightly, the bearings are worn and should be replaced.

How to Check Collars

To check the stationary saw collar runout, mount a dial indicator on top of the saw table so that the contact anvil touches the face of the collar close to the outside rim. Turn the arbor over slowly by hand, watching the dial closely for evidence of runout. There should be *none*. If runout is indicated, either the collar is worn and should be refaced or the arbor is sprung and should be straightened.

It is sound economy to keep your machine in good running condition and to use Simonds Saws for best results on every job.

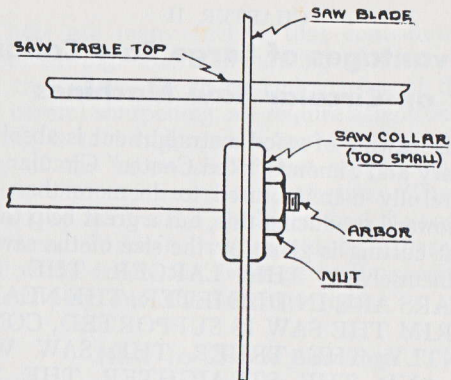
Advantages of Large Saw Collars on Circular Saw Machines

In the sawing of wood a straight cut is absolutely necessary and Simonds "Red Center" Circular Saws are carefully manufactured to do more than their share toward producing this, but a great help toward straight cutting is given by the size of the saw collars themselves. THE LARGER THE SAW COLLARS ARE IN DIAMETER, THE NEARER THE RIM THE SAW IS SUPPORTED, CONSEQUENTLY THE TRUER THE SAW WILL RUN AND THE STRAIGHTER THE SAW WILL CUT. IN ADDITION, LARGE COLLARS HELP TO PREVENT RIM VIBRATION WHICH IS ONE OF THE CAUSES OF CRACKS.

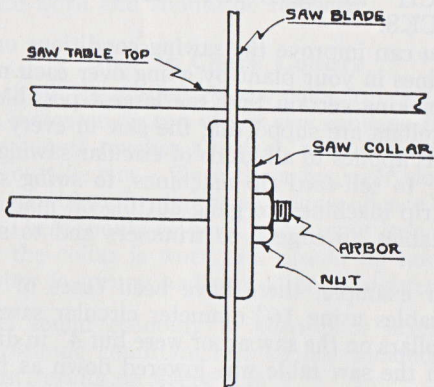
You can improve the sawing conditions on many machines in your plant by going over each machine and making certain that the largest possible diameter collars are supporting the saw in every case.

This applies to all kinds of circular sawing equipment; to self-feed rip machines, to swing saws, to gang rip machines, to gang cutting-off machines, to saw tables, to edgers, to trimmers and to slashers, etc.

For example, there have been cases of circular saw tables using 16" diameter circular saws where the collars on the saw arbor were but 4" in diameter. When the saw table was lowered down as far as it would go there was still plenty of room for 6" collars. These 6" diameter collars would have given the saw more support, made the saw run truer and



*Sketch A (Collars too Small)
Not Most Favorable Sawing Condition*



*Sketch B (Large Collars)
You Can Expect Maximum Performance From Saw Blade
and Saw Table With These Large Collars*

the saw table would have given better all-around performance. (See sketches.)

If you do not find it convenient to increase the diameter of the saw collars themselves as shown in Sketch B, the same results can be obtained by the use of large supporting or stiffening collars.

Supporting or Stiffening Collars

It is generally quite easy to increase the saw support on the equipment you now have by the use of stiffening collars. These stiffening collars are generally at least $\frac{1}{8}$ " thick, are larger in diameter than the regular saw collars and do afford much additional support to the saw. They are placed between the regular collars and against the sides of the saw itself. (See Sketch C.)

Some concerns find it desirable to have several sets of stiffening collars of different diameters for the same machine, enabling them to obtain the maximum amount of support as the saws wear down. This is particularly true on machines with the saw arbor above the table.

Stiffening collars are available and may be obtained on customer's order.

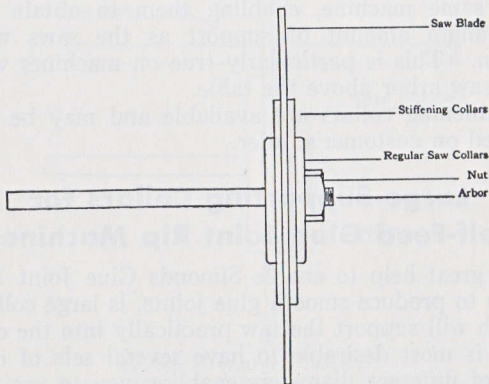
Large Supporting Collars for Self-Feed Glue Joint Rip Machines

A great help to enable Simonds Glue Joint Rip Saws to produce smooth glue joints, is large collars which will support the saw practically into the cut.

It is most desirable to have several sets of collars of different diameters enabling you to use the largest possible collars as the saw wears down.

On machines with the saw arbor above the table standard equipment generally consists of two supporting collars 7" diameter x $\frac{1}{8}$ " thick, 2—9" x $\frac{1}{8}$, and 2—11" x $\frac{1}{8}$. Some concerns also like additional collars 6" x $\frac{1}{8}$, 8" x $\frac{1}{8}$ and 10" x $\frac{1}{8}$, enabling them to get the benefit of the largest collar diameter as the saw wears down.

Machines with the arbor below the table generally have stationary collars 7" or 8 $\frac{1}{4}$ " in diameter. Regardless of the fact that these are good sized collars, more support for the saw and a stiffer, truer running saw can be obtained by the use of large supporting collars. To use supporting collars on machines with the arbor below the table it is first necessary to move the motor back $\frac{1}{8}$ " (that is, the thickness of the supporting collar so that the saw will still come in the middle of the feed chain). Then stiffening collars 11" diameter x $\frac{1}{8}$ " thick, 10" x $\frac{1}{8}$ ", and 9" x $\frac{1}{8}$ " can be used.



Sketch C (Stiffening Collars)

Sharpening Circular Saws

Keep your Circular Saws round and sharp. To obtain maximum performance and to avoid possible damage, the saws must be kept both round and sharp. When a saw does not cut easily, it is usually dull or has lost its set or swage. If you force the feed in this condition, you will heat the saw on the rim and it will expand and cause cracks. It also may cause the saw to lose its tension and bend or break over the collar. If the saw wobbles and does not cut straight it should be sent back at once to the Factory for retensioning and resharpener.

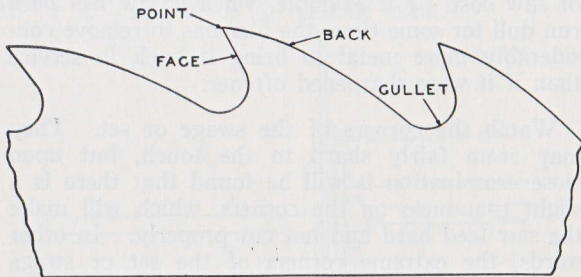
Frequent sharpening of saws not only keeps production up, but is economical from the standpoint of saw cost. For example, when a saw has been run dull for some time, the filer has to remove considerably more metal to bring it back in service than if it were sharpened oftener.

Watch the corners of the swage or set. They may seem fairly sharp to the touch, but upon close examination it will be found that there is a slight roundness on the corners, which will make the saw feed hard and not cut properly. In other words, the extreme corners of the set or swage are slightly rounded. Although the set or swage may seem to be full, the saw will feed hard on account of binding just back of the points. To overcome this, the saw must be rounded or jointed below the rounded corners and then brought back to a nice keen point.

Do not allow your saws to accumulate gum or pitch on the sides. This may cause them to run warm and snake. The best method of removing hardwood gum from the sides of a saw is to soak the saw in hot water for a few minutes, then wipe with a rag. The saw will then be bright and clean. Never scrape off gum with a sharp tool. It is apt to scratch the saw and it will gum up that much quicker.

There are four important operations in sharpening all Flat Ground Circular Saws, such as Rip Saws, Cut-off Saws and Flat Ground Combination Saws. The sharpening operations in order of their occurrence are, rounding, gumming, setting or swaging, and filing.

There are three operations in sharpening Hollow Ground Saws. They are — rounding, gumming and filing.

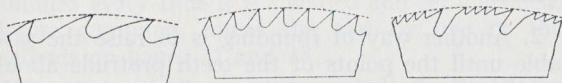


Sketch A

Sketch "A" shows and names the different parts of a Rip Saw tooth. It is well to know these various terms. The same terms apply to Cut-off Saw, Planer Saw or Combination Saw teeth.

Rounding

The best method of keeping Rip and Cut-off Saws round and sharp is by using an automatic sharpening machine. When such a machine is not available it is necessary to sharpen by hand and the first operation is rounding or jointing. For the saw to give maximum production every tooth must do its part and that means that the saw must be perfectly round.



Rip Saw

Cut-off Saw
Sketch B

Planer Saw

Be sure the cutting teeth are all the same height. See Sketch B.

If every tooth does not do the same amount of cutting, the unequal strain upon the high teeth may cause cracks, and if there are several teeth which are unusually high they may be broken off when encountering a knot. This condition can be remedied by rounding, which means making all the teeth the same height. There are two common ways of rounding or jointing.

1. Place a flat Simonds Abrasive Vitrified Medium Jointer Stone 1 x 2 x 6 or a piece of broken emery wheel on the saw table and then press it lightly but firmly against the points of the teeth

while the saw is revolving at full speed, until all the teeth show a small dull spot or "land" on top. The Abrasive Stone should be handled carefully to avoid accident. Be sure to hold the stone square to the saw. On flat ground saws to check that the stone has been held correctly, stop the saw and check the teeth with a square. The land on top should be at right angles to the side of the saw. On Hollow Ground Saws the best way of checking is to make a short cut in a planed piece of soft wood and then examine the end of the kerf to see that it is square.

2. Another way of rounding is to raise the saw table until the points of the teeth protrude about $1/64$ " and when the saw is running at full speed, pass the Abrasive Stone back and forth across the top of the saw until all the teeth are of equal length. If some of the teeth are quite low, it may be necessary to lower the table very slightly after the first rounding and repeat the operation.

Mounting Saw on Arbor

Caution: The saw should always be put back on the arbor in the same position to insure a round, true running saw. Before you take the saw off, turn the arbor so the etched trademark on the saw is directly above the arbor and then make a mark on the arbor right below the etched trademark to indicate that that side of the arbor was up when you took the saw off. Then when replacing the saw on the arbor after sharpening be sure to turn the arbor so that the mark is up and then place the saw on the arbor with the

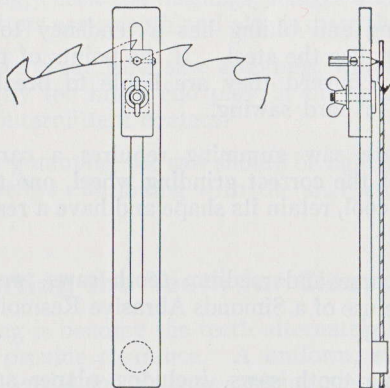
etched trademark directly over the mark on the arbor.

Before placing the saw on the machine be sure that both the saw and collars are free from dirt and dust which will prevent the saw from running true.

Gumming

Repeated filing is bound to make the teeth shallow and grinding them deeper with a grinding wheel is known as gumming. A saw does not need to be gummed every time it is rounded and set and filed. Before gumming, round the saw by one of the methods on pages 17 and 18.

To insure that you will gum all the teeth the same depth so the saw will be in balance, it is an easy matter to make a simple wooden compass



with a round piece of wood to fit the centerhole of the saw. See Sketch. Drill a hole to hold a

blue pencil and describe a circle the proper distance below the teeth. Then gum until the bottom of all the gullets just touch the edge of the circle.

When gumming with a grinding wheel, the operation should be performed by going around the saw several times. Do not crowd the wheel and take too deep a cut. Doing too much work at one time will heat the gullets and stretch the rim so that the saw will need hammering to restore the original tension. Crowding the wheel so as to blue and burn the gullets is sure to injure the saw, often glazing it so hard that a file will make no impression on it. From these hard spots small cracks begin, invisible at first to the eye, but gradually enlarging until they become dangerous fractures.

Burning and bluing has a tendency to harden and crystalize the steel. If the points of the teeth are badly burned they are liable to break off or crumble in hard sawing.

Accurate saw gumming requires a careful selection of the correct grinding wheel, one that will cut fast, cool, retain its shape and have a reasonably long life.

For coarse and medium tooth saws, we recommend the use of a Simonds Abrasive Resinoid Wheel A-369-N-B.

For fine tooth saws, including planer saws and cut-off saws, we recommend a Simonds Abrasive Resinoid Wheel A-46-E-07-B1.

If a Vitrified wheel is preferred we recommend a Simonds Abrasive Vitrified Wheel NA 46-M-V.

NOTE: For these wheels to function properly, they should run from 5000 to 6000 surface feet per minute. As wheels wear down in size their speed in revolutions per minute should be increased to maintain constant speed in surface feet per minute.

The face of the grinding wheel should always be round and of sufficient thickness to give a good large round gullet. When the wheel face glazes, gums or fills, it should be dressed with a grinding wheel dresser. The grinding wheels should be mounted with blotters on both sides of the wheel. Bushing, flanges and sides of the wheel should be perfectly clean in order to insure a true running wheel. Should a new wheel not run true after mounting, check the bushings, flanges and see that the blotters are smooth and also inspect the spindle.

Uneven wear in a saw gumming wheel is often caused by too much end play in the spindle causing an intermittent contact.

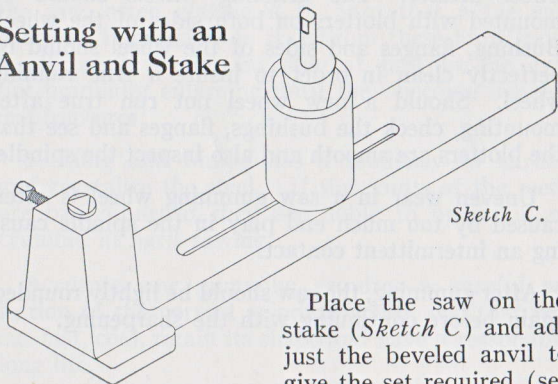
After gumming, the saw should be lightly rounded again before continuing with the sharpening.

Setting the Teeth for Clearance

Setting is bending the teeth alternately right and left to provide clearance. A uniform, even set is most essential for an easy running smooth cutting saw. Unevenly set teeth place a greater strain on some teeth than on others and may cause them to

crack. Too much set not only places an unnecessary strain on the rim of the saw, resulting in cracked gullets or broken teeth, but will also cause the saw to chatter or vibrate, resulting in a rough cut. Not enough set will cause the saw to bind or jam in the cut. This heats the rim and gullet cracks appear. If the teeth are all set more on one side than the other, the saw will lead to the side with the heaviest set and breakage will result. There are two ways of setting the teeth.

Setting with an Anvil and Stake



Sketch C.

Place the saw on the stake (*Sketch C*) and adjust the beveled anvil to give the set required (see table) and set the teeth with a setting hammer. Be sure that the set does not extend more than one-quarter of the distance down the tooth as the points of the teeth do all the cutting. Also if the set extends too far down the tooth, it will cause the tooth to vibrate and cut rough. The following table gives the amount of set generally used.

FOR DRY SOFT WOOD—

2 gauges set on each side of saw

FOR GREEN SOFT WOOD—

2½ gauges set on each side of saw

Hardwood requires slightly less set than soft wood.

On saws for Electric Hand Saw Machines, on account of the rough work they do, we recommend 2½ gauges set on each side of saw.

Example of Setting a Saw for Dry Soft Wood

If the saw is 16 gauge (.065), 2 gauges set per side would make saw kerf 12 gauge (.109).

The accompanying sketch illustrates this clearly.

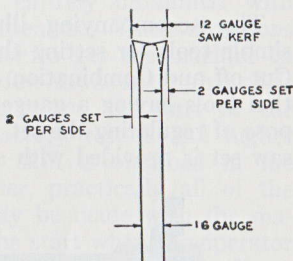


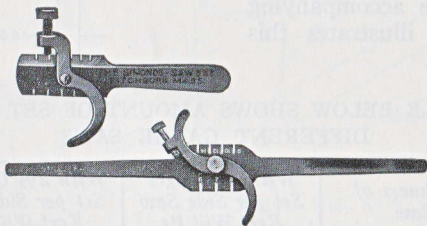
TABLE BELOW SHOWS AMOUNT OF SET FOR DIFFERENT GAUGE SAWS

<i>Thickness of Saw</i>	<i>With 2 Gauges Set per Side Saw Kerf Will Be</i>	<i>With 2½ Gauges Set per Side Saw Kerf Will Be</i>
10 ga	6 ga (.203)	5 ga (.220)
11 ga	7 ga (.180)	6 ga (.203)
12 ga	8 ga (.165)	7 ga (.180)
13 ga	9 ga (.148)	8 ga (.165)
14 ga	10 ga (.134)	9 ga (.148)
15 ga	11 ga (.120)	10 ga (.134)
16 ga	12 ga (.109)	11 ga (.120)
17 ga	13 ga (.095)	12 ga (.109)
18 ga	14 ga (.083)	13 ga (.095)
19 ga	15 ga (.072)	
20 ga	16 ga (.065)	

After you determine the amount of set which works best on your particular job if you want a good smooth cut it is well to make a simple side gauge to check the set of each tooth. Directions and sketches for making this simple but efficient side gauge and directions for its use are given on pages 76 and 77.

Setting with a Saw Set

The accompanying illustration represents two simple tools for setting the points of teeth in Rip, Cut-off and Combination Saws. They are combination tools having a gauge attachment for the purpose of regulating the set. It can be seen that this saw set is provided with setting slots which are so



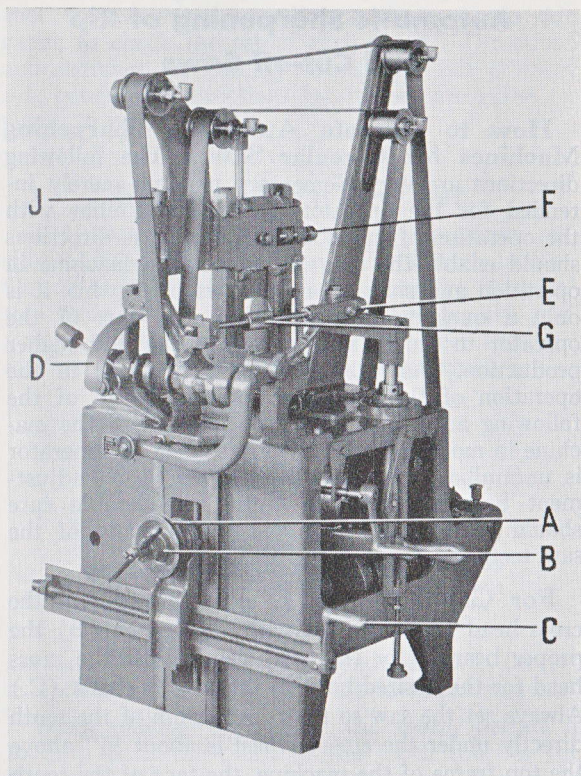
graduated as to give the desired depth to the set in each gauge of teeth they are intended to set.

When placing the set on the tooth, permit it to drop until the point of the tooth touches the bottom of the slot and bend the tooth over until the gauge touches the side of the saw. The set will then be uniform and accurate. For the amount of set see page 23.

Automatic Sharpening of Rip and Cut-off Saws

How to Operate Automatic Sharpening Machines for Circular Saws. The following directions are very elementary and are merely intended for the operator entirely unfamiliar with the operation of saw sharpeners. These directions should enable the operator to get the machine in operation and sharpen a few saws. After this, it is only a question of practice on the part of the operator to secure satisfactory results and higher production. As soon as skill is obtained in the operation of the sharpener, practically all of the following adjustments may be made with the machine in motion, but at the start when the operator is unfamiliar, we would suggest that each adjustment be made separately and considerable care should be exercised to avoid spoiling any of the saw teeth.

For Cut-off Saws. 1. Put the saw on the cross head (A.) Adjust with taper cone (B) the proper bearing for the saw, then adjust the cross head for the desired hook in the saw by crank (C.) Always set the saw so that the bottom of the tooth directly under the emery wheel is about $\frac{1}{2}$ " above the top frame of the machine, the face of the tooth standing in alignment with the right side of the grinding wheel coming in contact with the face of the tooth in its descent.



Automatic Sharpening Machine for Circular Saws

2. Next ascertain the proper stroke of feed finger. To do this, run the machine by hand one stroke of the feed finger and see that the feed finger has stroke enough to drop about one-half way back of the tooth. The stroke adjustment is obtained by a hand wheel located on the feed arm inside at the left as one faces the machine.

In starting up the machine to grind cut-off saws that have formerly been fitted by hand, and which are in most cases unevenly spaced, the machine should be adjusted so that the feed finger will work two teeth back of the tooth engaged by the emery wheel. By fitting the saw in this manner, it will be possible to get the teeth evenly spaced after which the machine may be adjusted to feed directly back of the tooth in which the wheel engages.

3. Then adjust by hand wheel (D) on feed arm head the exact forward stroke of the finger which should be so that when the emery wheel is lowered, the back side of the same will come in contact with the front of the tooth, then let the emery wheel go clear down to the bottom of the tooth and be sure that the cam roller on the lift arm is resting on the lowest part of the lift cam.

4. Turn slowly by hand and as soon as the wheel starts to rise from the bottom of the tooth see that the feed finger at the same movement will start to feed the saw forward. If not, adjust the stroke a little shorter or longer, as the case may need. If it is not possible to secure the desired results by adjusting the stroke, it may be necessary to loosen the cam holder on the cam shaft and revolve the holder forward or backward as necessary.

After the machine feeds satisfactorily, see if the grinding wheel follows the tooth outline.

5. The machine may now be started but do not let the wheel grind too hard until the saw has gone at least once around, then adjust the amount of bevel desired at point "E," then see if the grinding wheel grinds all teeth evenly. If it is found it alternates, hitting the first tooth hard and the second tooth light, the center of the grinding wheel is not directly over the saw, and this should be adjusted by means of the center adjuster at point "F" until all teeth are evenly ground. In sharpening unevenly spaced teeth for the first time, it may be necessary to even up the saw before satisfactory results can be obtained in beveling the teeth.)

If the wheel should swing more to one side than the other, adjust the connecting rod "G" to overcome this condition.

For Rip Saws. Follow the same instructions as for cut-off saws except that the connecting rod should be disconnected from the machine, and the center screw "J" should be tightened into the socket in the vertical spindle.

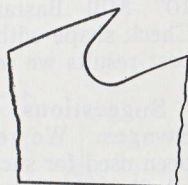
Sometimes it is necessary to file or grind the cams in order to generate exactly the type of tooth desired. This can be done by filing from the cam at the point where the grinding wheel raises away from the tooth of the saw an amount necessary to cause the grinding wheel to follow the back of the tooth.

Sharpening Rip Saws

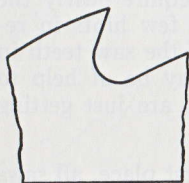
SWAGING

Swaging is spreading the point of every tooth for clearance. A swaged saw will cut more wood than a set saw because every tooth is cutting the full width of the kerf. A swaged saw will take a faster feed and will also take more power.

The teeth should be kept in proper shape for swaging. They should be slim enough to swage out easily but not too slim (*see Sketch D*) or they will spread too much at the extreme points when swaging. In this case, the corners will be needle-pointed and break off or bend



Sketch D

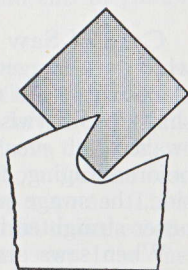


Sketch E

back in the cut. On the other hand, if the teeth are too stout or too wide (*as in Sketch E*) they will require double the amount of pressure to spread them. Ex-

erting so much pressure is liable to split them in the middle.

The best way to maintain the proper tooth shape is by making a template of the new tooth when it is received from the factory. Take a piece of thin metal and file it out so the tip



Sketch F

of the tooth in the new saw will just fit in (*Sketch F*), then use this template to guide you for tooth shape when gumming and filing the teeth.

Before swaging, round the saw in accordance with one of the methods on pages 17 and 18, then if the teeth are shallow, the gullets should either be gummed out with a grinding wheel or filed to a uniform depth with a Red Tang 8" Round File.

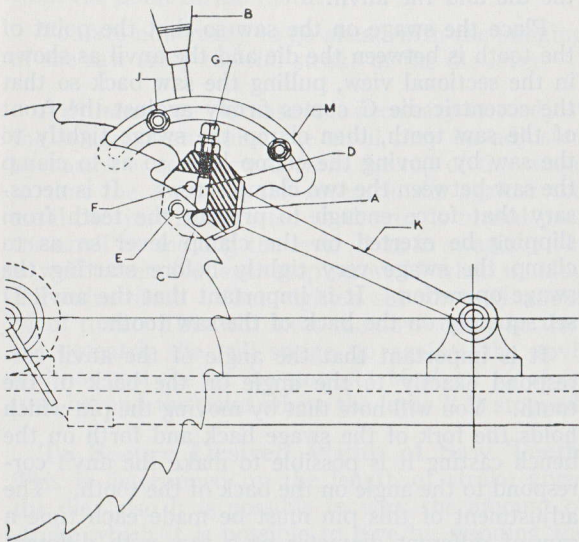
File all the teeth sharp, using a Red Tang 8" or 10" Mill Bastard File with two round edges. Check shape with template mentioned above. For best results we recommend a lever swage.

Suggestions for Proper Use of Lever Swages. We realize that saw swages have now been used for such a great length of time that most all filers are thoroughly familiar with the adjustment and use of these machines, as all hand swages work on the same principle and require nearly the same adjustment. Nevertheless, a few hints in regard to the machines and keeping the saw teeth in proper condition to be swaged may be of help to many, especially to beginners who are just getting a start in this line of work.

Care of Saw Teeth. In the first place, all saws which are swaged should be ground on some machine which will make all teeth of uniform size and shape. Otherwise, it would be impossible for any swage to do even work. All teeth should be straight before swaging, for in case a tooth is bent to one side, the swage will often throw it farther but will never straighten it.

When saws are being swaged for the first time, the swage dies should be set to open wider than

usual, and swage the saw once around, then grind it until the mark of eccentric die on face of tooth is ground out; then swage the saw again and the points of teeth should be of full working size.



Before placing the swage upon the saw, see that lever A (which is attached to the lever clamp screw) is turned far enough to the left to withdraw the lever clamp screw far enough from the stationary clamp screw so that there is room for the saw tooth to pass between the two clamp screws. Then see that the lever B (which is attached to the eccentric die) is back against the lever rest J in the position indicated above. This opens up the dies

of the swage by turning the highest point of the eccentric die C away from the anvil D, as shown in the sectional view of the swage, so that there is room for the point of the tooth to enter between the die and the anvil.

Place the swage on the saw so that the point of the tooth is between the die and the anvil as shown in the sectional view, pulling the saw back so that the eccentric die C comes firmly against the front of the saw tooth, then clamp the swage tightly to the saw by moving the clamp lever so as to clamp the saw between the two clamp screws. It is necessary that force enough to prevent the teeth from slipping be exerted on the clamp lever so as to clamp the swage very tightly before starting the swage operation. It is important that the anvil D set squarely on the back of the saw tooth.

It is important that the angle of the anvil correspond exactly to the angle on the back of the tooth. You will note that by moving the pin which holds the fork of the swage back and forth on the bench casting it is possible to make the anvil correspond to the angle on the back of the tooth. The adjustment of this pin must be made each time a saw of different diameter or a saw with different back angle is to be swaged. With the swage clamped firmly to the tooth, exert only enough power on the swage lever E to make a slight impression on the tooth.

Remove the swage and see if it bends the teeth up or down; if the swage turns the point of teeth up, move the pin on bench casting nearer to the saw. If it turns them down too much, move the pin on bench casting farther away from the saw. The

correct adjustment for the swage is to have the points of the teeth tipped downward slightly so that when grinding the saw after swaging, only a minimum amount of stock will necessarily be removed from the point of the tooth.

You are now ready to go ahead with the swaging of the saw using the full stroke of the die lever.

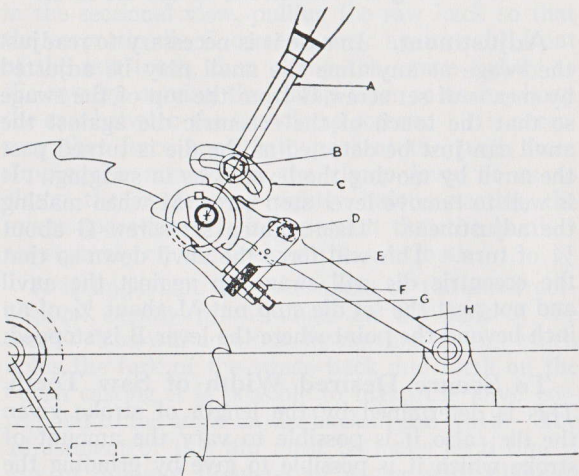
Adjustment. In case it is necessary to readjust the swage at any time the anvil may be adjusted by means of set screw G from the top of the swage so that the touch of the eccentric die against the anvil can just be detected as the die is turned past the anvil by moving the lever B as in swaging. It is well to remove lever stop screw M when making the adjustment. Then tighten set screw G about $\frac{1}{4}$ of turn. This will force the anvil down so that the eccentric die will swage up against the anvil and not past the set die stop nut M about $\frac{1}{4}$ of an inch beyond the point where the lever B is stopped.

To Secure Desired Width of Saw Teeth. This is determined by the length of stroke given the die; also it is possible to vary the amount of stroke which it is possible to give by grinding the cut off point on the anvil ahead in order to maintain the correct relationship between the point of the tooth and the cut off point on the anvil.

We would not recommend that the anvil be re-ground until you are quite familiar with the operation of swaging. Do not attempt to pull up all of the stock required with one pull of the die as it will take from three to four swagings and regrindings in order to build up a satisfactory amount of stock.

Suggestions for Proper Use of Shaper. The illustration shows a Circular Saw Shaper.

The shaper must be so set that the tooth stop G rests firmly on the back of the tooth. This adjustment can be taken care of by moving the pin which holds the bracket of the shaper to the bench attachment back and forth as the case may require.

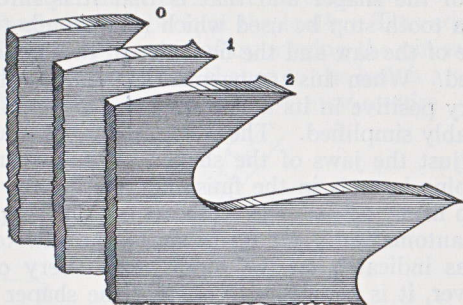


The function of the shaper is to form by means of pressure action the rough swage tooth in such a manner that all of the teeth are of an exact width, and the correct cutting angles are automatically pressed into the swage portion of the tooth.

The operation of the shaper and construction of the shaper is so simple that its adjustment is usually self-evident to the operator of the tool and therefore, no directions for the operation of this

tool are generally required. There is, however, one point which may be easily overlooked in the operation of the shaper and that is that it is intended that a tooth stop be used which corresponds to the gauge of the saw and the final size of the saw being shaped. When this arrangement is used, the shaper is very positive in its action, and the set-up is considerably simplified. The usual set-up procedure is to adjust the jaws of the shaper so that when the clamping lever is in the finishing position the jaws clamp firmly against the tooth stop. The shaper is thus automatically set up to shape the saw to the size as indicated on the tooth stop. Very often, however, it is necessary to operate the shaper with a tooth stop which does not correspond to the thickness of the saw blade and the finished gauge of the tooth. This may be done, but, of course, it is necessary that as thin or thinner a tooth stop be used than the gauge of the saw to be shaped. When adjusting the shape in this manner it is usually customary to remove the tooth stop from the shaper and clamp the shaper firmly on a tooth which has already been formed to the desired size such that the opening of the jaws corresponds to the desired width of the shape. The tooth stop is then placed in the shaper and pulled against the face of the tooth and the hold-down bolt tightened securely. The shaper is then ready to operate and will form the teeth to the correct gauge even though the tooth stop is not of the correct size for the particular saw on which the tool is being used. It is quite possible that it will be necessary to grind the jaws on a different angle or a longer bevel to fit different styles of teeth, as the shape of the swaged portion of the

teeth, clearance angles, etc., vary largely when the saws are used in various types of wood.

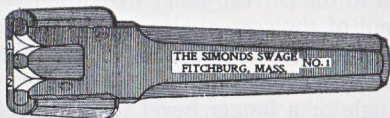


Sketch G

Swaging with Upset

Before swaging, round the saw in accordance with one of the methods on pages 17 and 18, then if the teeth are shallow, the gullets should either be gummed out with an emery wheel or filed to a uniform depth with a "Red Tang" 8" Round File.

File all the teeth sharp as illustrated in Figure 0, *Sketch G*. Use a "Red Tang" 8" or 10" Mill Bastard File with two round edges. Check shape with template (*Sketch F*, Page 29.) Then use a Simonds No. 1 swage (*Sketch H*) if the saw is 10 gauge and heavier or a No. 2 swage if it is 11 gauge and lighter.



Sketch H

Keep a drop of oil on the jaws while working on the tooth. Note that there are two dies in the head of the swage. No. 1 is a convex die while No. 2 is a flat die. Place the No. 1 die on the tooth first and strike several light quick blows with a small setting hammer. This spreads the tooth like Fig. 1, *Sketch G*. Do not bend the swage over to one side or the other but keep it in a straight line with the tooth. Also, when holding the swage up to the teeth, hold it so that the dies center on the tooth. Do not tip it too far up or too far down.

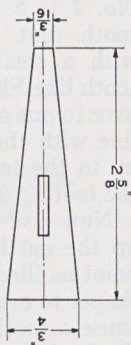
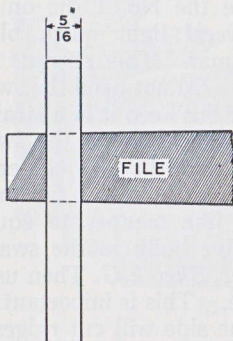
Now use die No. 2 in like manner to square up the cutting edge and give body to the swaged point as illustrated in Fig. 2, *Sketch G*. Then use a shaper to even up the swage. This is important because a tooth swaged to one side will cut ridges in the lumber. To evenly distribute the strain and to insure well cut lumber the teeth should be in perfect alignment and all swaged to the same width.

Filing Rip Saws with Swaged Teeth

First round the saw and swage the teeth as described on pages 17 and 18 and 29 to 33, then round the saw again very lightly and then with a "Red Tang" 8" or 10" Mill Bastard File with two round edges, file straight across the underside of tooth and then file the top very slightly. Be careful not to alter the original angle of the tooth and also avoid round corners for round corners reduce side clearance and cause the saw to bind and burn in the cut. Also guard against too thin an edge as it will weaken the cutting point of the tooth.

After swaging, shaping and filing, the teeth should be side filed so the saw will cut smoothly.

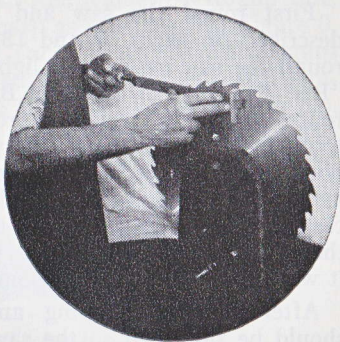
First make a simple tapered wooden holder with a slot in the middle to fit the end of an 8" or 10" "Red Tang" Mill Bastard File. See Sketches.

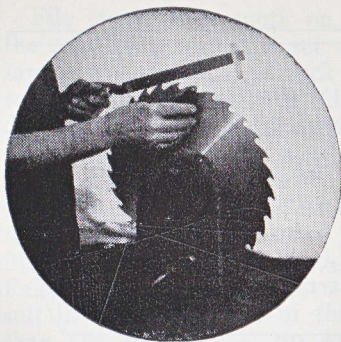


File Holder

By using this holder you eliminate the possibility of leaving a flat spot on the side of the teeth. Leaving a flat spot on the sides of the teeth will cause the saw to bind in the cut.

Take the file and holder and a side gauge exactly like the one illustrated on pages 76, 77. The gauge should be adjusted for the amount of swage wanted on each side of the tooth. About two gauges of swage on each side is generally





used. Then take the file and side file each tooth until the point just touches the gauge. *See illustrations.*

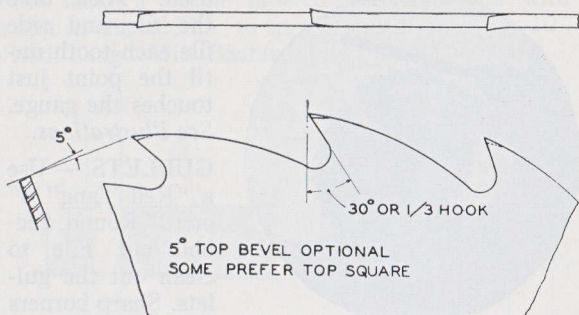
GULLETS — Use a "Red Tang" 8" or 10" Round, Second cut File to clean out the gullets. Sharp corners in the gullets are

the most frequent cause of cracks in circular saws.

HOOK—For a rip saw to cut fast and easily, the teeth should be hooked so that a line along the face or front of the tooth will pass half way between the center of the saw and the rim. *See Sketch J on page 42.*

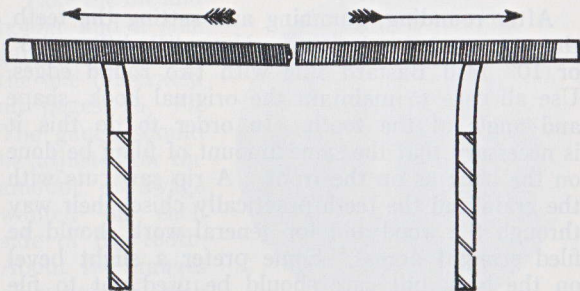
Filing Rip Saws with Set Teeth

After rounding, gumming and setting the teeth, the next operation is filing. Use a "Red Tang" 8" or 10" Mill Bastard File with two round edges. Use all care to maintain the original hook, shape and angle of the tooth. In order to do this it is necessary that the same amount of filing be done on the back as on the front. A rip saw cuts with the grain and the teeth practically chisel their way through the wood and for general work should be filed straight across. Some prefer a slight bevel on the back but care should be used not to file too much bevel on the back of rip saw teeth as a



beveled tooth has a tendency to split the fiber instead of cutting it squarely across. Too much bevel also produces lateral motion which causes the teeth to chatter and vibrate in the cut, which makes a rough cut and also will eventually cause cracks.

When filing the backs of rip saw teeth, do not file each successive tooth on the back. (See *Sketch I*).

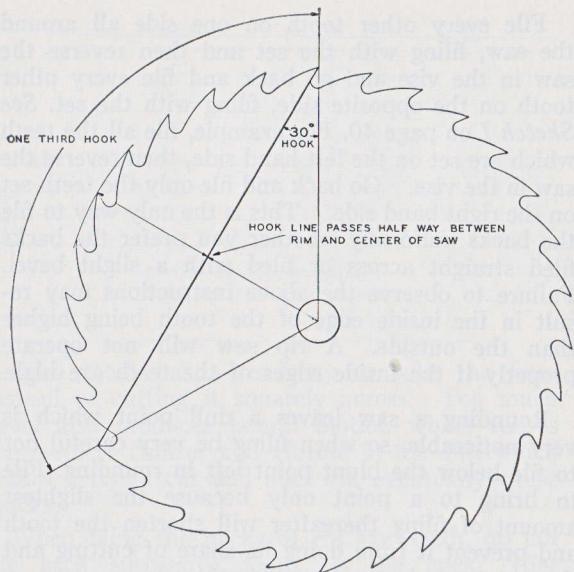


Sketch I

File every other tooth on one side all around the saw, filing with the set and then reverse the saw in the vise and go back and file every other tooth on the opposite side, filing with the set. See *Sketch I* on page 40. For example, file all the teeth which are set on the left hand side, then reverse the saw in the vise. Go back and file only the teeth set on the right hand side. This is the only way to file the backs uniformly whether you prefer the backs filed straight across or filed with a slight bevel. Failure to observe the above instructions may result in the inside edge of the tooth being higher than the outside. A rip saw will not operate properly if the inside edges of the teeth are high.

Rounding a saw leaves a dull point which is very noticeable, so when filing be very careful not to file below the blunt point left in rounding. File to bring to a point only because the slightest amount of filing thereafter will shorten the tooth and prevent it from doing its share of cutting and throw too much strain on the others.

Hook—For a rip saw to cut fast and easily the teeth should be hooked so that a line along the face or front of the tooth will pass halfway between the center and the rim. See *Sketch J*. An easy way to check this hook without any instruments is to mark any tooth and, starting with *the next tooth*, count off one-third of the number of the teeth in the saw and stop there and mark that tooth. That is, if there are thirty teeth in the saw, count off ten teeth, beginning with the first tooth after the one marked. Then a line drawn along the face of the first marked tooth should touch



Sketch J

the point of the second marked tooth. This is known as one-third hook and the actual hook angle is 30 degrees.

Keep the Gullets Round — Use a "Red Tang" 8" or 10" Round Second Cut File to clean out the gullets. Sharp corners in the gullets are the most frequent cause of cracks.

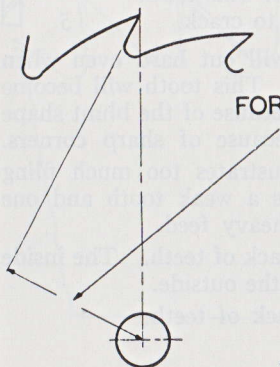
Hook Conversion Table

At various points in the book we are obliged to give you the hook of cutting teeth and rakers in degrees. The following table converts this "hook in

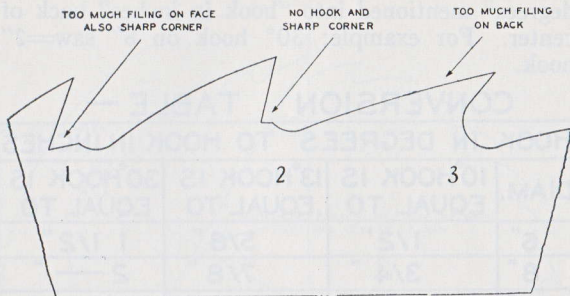
degrees" mentioned into "hook in inches" back of center. For example: 30° hook on 8" saw=2" hook.

CONVERSION TABLE —

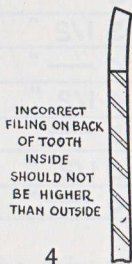
HOOK IN DEGREES TO HOOK IN INCHES			
DIAM.	10° HOOK IS EQUAL TO	13° HOOK IS EQUAL TO	30° HOOK IS EQUAL TO
6"	1 1/2 "	5/8 "	1 1/2 "
8"	3/4 "	7/8 "	2 — "
10"	7/8 "	1 1/8 "	2 1/2 "
12"	1 — "	1 3/8 "	3 — "
14"	1 1/4 "	1 5/8 "	3 1/2 "
16"	1 3/8 "	1 3/4 "	4 — "
18"	1 1/2 "	2 — "	4 1/2 "
20"	1 3/4 "	2 1/4 "	5 — "
22"	1 7/8 "	2 1/2 "	5 1/2 "
24"	2 1/8 "	2 3/4 "	6 — "



FOR EXAMPLE:-30° HOOK
ON 8" SAW = 2" HOOK.



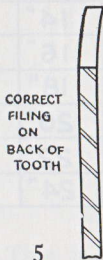
Sketch K



4

We are showing in *Sketch K* common mistakes in filing.

1. The first tooth shows too much filing on the face with an improper file which left a sharp corner. This tooth is very apt to crack.



5

2. The second tooth will cut hard even when sharp for it has no hook. This tooth will become dull in a very short time because of the blunt shape and is liable to crack because of sharp corners.

3. The third tooth illustrates too much filing on the back. This makes a weak tooth and one which will vibrate under heavy feed.

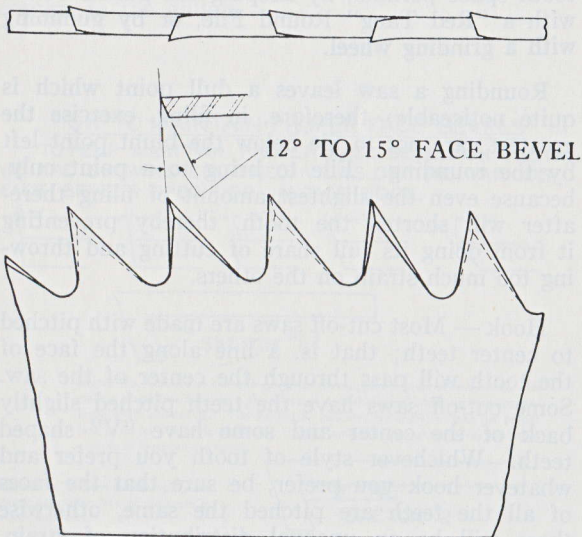
4. Incorrect filing on back of teeth. The inside should not be higher than the outside.

5. Correct filing on back of teeth.

CHAPTER VI

Filing Cut-off Saws

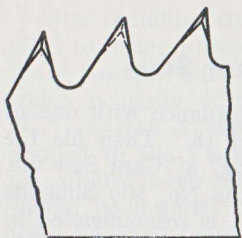
First, round, gum and set the saw in accordance with the instructions on pages 17 to 24. In filing coarse tooth cut-off saws we recommend using "Red Tang" 8" or 10" Mill Bastard Files with 2 round edges. For Cut-off saws with about $\frac{5}{16}$ to $\frac{3}{8}$ " space we recommend "Red Tang" 8" Cant Saw Files. For Cut-off saws with tooth spaces $\frac{1}{4}$ " and finer we recommend 8" Cant Saw or 6", 7" and 8" Slim Taper Files.



In filing, use care to maintain the original bevel and angle of the teeth. The teeth should be of uniform width and shape and the gullets of equal depth and width. Every tooth should have the same amount of bevel; about 12 to 15 degrees is generally recommended. In soft fibrous woods a somewhat longer bevel is sometimes used but in dry hard woods a shorter face bevel is used. The long bevel does not stay sharp long in hard wood. Do not file an extremely wide bevel on the face of cut-off teeth because this produces severe lateral strains and may cause cracks. Much trouble can be avoided from cracking of cut-off saws if the tooth space permits, by keeping the gullets round with a "Red Tang" Round File, or by gumming with a grinding wheel.

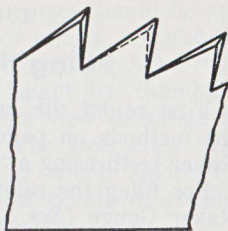
Rounding a saw leaves a dull point which is quite noticeable; therefore, in filing, exercise the greatest care not to file below the blunt point left by the rounding. File to bring to a point only, because even the slightest amount of filing thereafter will shorten the tooth, thereby preventing it from doing its full share of cutting and throwing too much strain on the others.

Hook — Most cut-off saws are made with pitched to center teeth; that is, a line along the face of the tooth will pass through the center of the saw. Some cut-off saws have the teeth pitched slightly back of the center and some have "V" shaped teeth. Whichever style of tooth you prefer and whatever hook you prefer, be sure that the faces of all the teeth are pitched the same, otherwise there will be an unequal distribution of strain.



No. 1

Sketch L

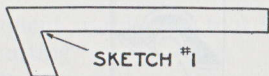
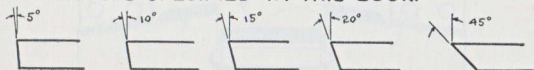


No. 2

No. 1 *Sketch L* shows cut-off teeth correctly filed. No. 2 shows teeth incorrectly filed with sharp corners in the gullets.

HOW TO MAINTAIN PROPER FACE BEVELS

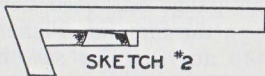
TO HELP MAINTAIN PROPER FACE BEVEL ON TEETH, WE ARE SHOWING ENLARGED VIEWS OF THE VARIOUS FACE BEVELS SPECIFIED IN THIS BOOK.



SKETCH #1

Sketch No. 1 illustrates a simple gauge for checking the amount of face bevel. To make a gauge like this, take a thin piece of steel about $\frac{3}{64}$ " thick and the approximate width and length. File the notch (indicated by arrow) to take the proper face bevel for your style of tooth. Use the enlarged view of the bevel wanted as a guide in filing out the notch.

Sketch No. 2 shows how to apply the gauge against the face of the tooth to check the bevel.



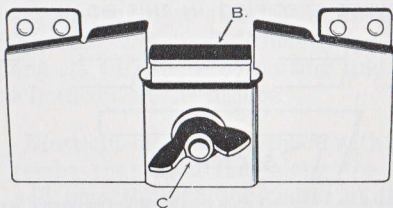
SKETCH #2

CHAPTER VII

Filing the Planer Saw

First round the saw in accordance with one of the methods on pages 17 and 18. Then file the Raker teeth using a "Red Tang" 8" Cant Saw file.

For filing the raker teeth the No. 306 Simonds Raker Gauge (See *Sketch M*) is recommended to keep the raker $1/64$ " below the cutting teeth. This is very essential because in this type of combination saw, the cutting teeth sever the fibres on each side just ahead of the rakers and then the rakers come along and clean out the center of the cut which is called the core. If the rakers are filed too short, they cannot do their proper share of the work. If the rakers are the same height as the cutting teeth they will do the work of the cutting teeth and the saw will feed hard and will leave splinters on the bottom of the cut.

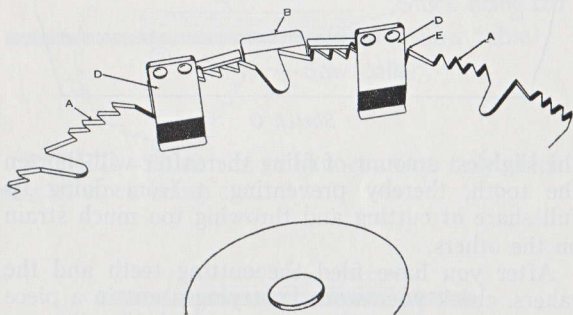


Sketch M

This gauge has been developed for use particularly on the Simonds Planer Saw but is also adaptable to any circular saw having raker or cleaner teeth.

After rounding the saw the gauge should be applied to insure proper height of rakers. *Sketch M* shows working parts of the Tool, Filing Anvil "B" which is easily adjusted to height by thumbnut "C." *Sketch N* shows opposite view of gauge as applied to the Planer Saw. The steel clips "D" are slipped over the saw after which anvil "B" should be lowered $1/64$ " below points of cutting teeth "A" and thumbnut tightened.

File each raker level with the anvil and then remove gauge and file raker to sharp edge as at



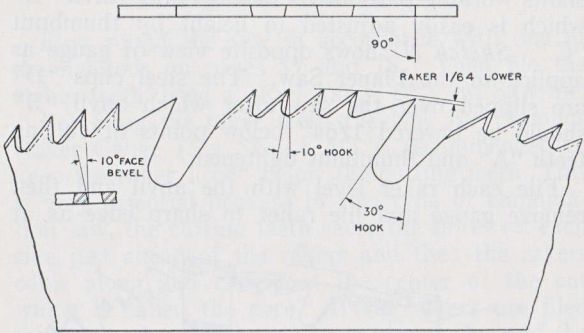
Sketch N

"E." Frequent use of this tool insures the fastest, cleanest cutting.

Then file the cutting teeth with 10 degree bevel on the face, maintaining the 10 degree hook. See *Sketch O*. Be sure to use a "Red Tang" 8" Cant Saw file. A slim Taper File will take out the hook and the hook is necessary for fast cutting.

Rounding the saw leaves a dull point which is quite noticeable, therefore in filing exercise the

greatest care not to file below the blunt point left in rounding. File to bring to a point only because

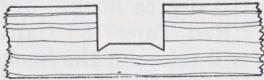


Sketch O

the slightest amount of filing thereafter will shorten the tooth, thereby preventing it from doing its full share of cutting and throwing too much strain on the others.

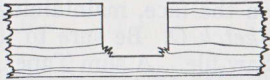
After you have filed the cutting teeth and the rakers, check your work by trying a cut in a piece of planed wood. The cut should look like A.

When filing the face of the raker or gumming the raker deeper, be sure to maintain the original 30 degree hook. This hook is essential for fast, easy cutting.



A

Correct
Rakers shorter than
cutting teeth

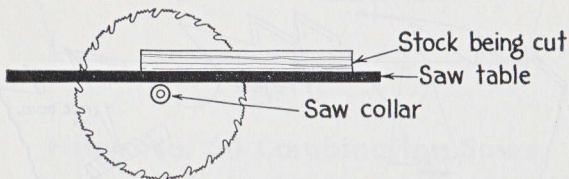


B

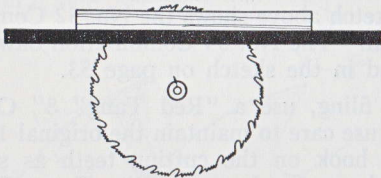
Incorrect
Rakers longer than cutting teeth,
will tear grain fibres

Projection of Concave Ground Saws Through Cut

Concave ground saws have less clearance than set saws. To barely clear work leaves too much of thick rim in the cut, causing friction and burning. Saws should be projected well up through the cut, allowing all of thick rim to run free except portion actually in the thickness of stock itself.



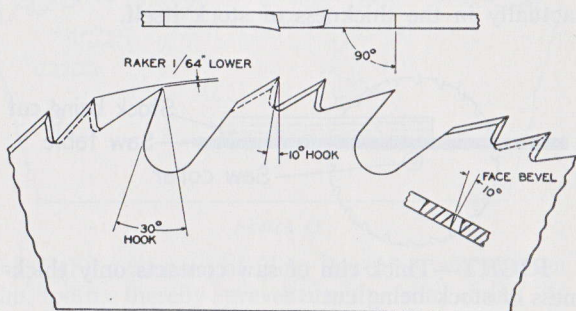
RIGHT—Thick rim of saw contacts only thickness of stock being cut.



WRONG—Too much of thick rim of saw in stock being cut—Saw burns.

Filing No. 52 and No. 54 Flat Ground Combination Saws

First, round, gum and set the saw in accordance with the instructions on pages 17 to 24.

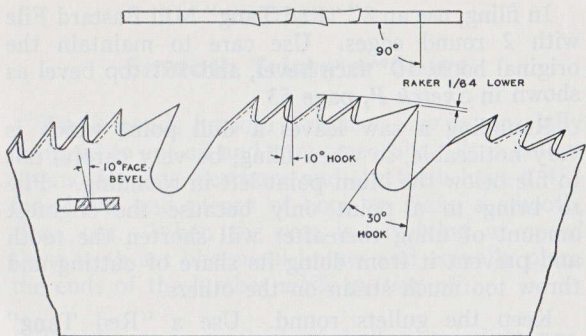


No. 52

The sketch above shows the No. 52 Combination Saw tooth. The No. 54 Combination Saw tooth is illustrated in the sketch on page 53.

When filing, use a "Red Tang" 8" Cant Saw File and use care to maintain the original 10° bevel and 10° hook on the cutting teeth as shown in the sketches. Don't use a Slim Taper File as it takes out the hook in the cutting teeth.

The cutting teeth and rakers in these Flat Ground Combination Saws are filed in the same manner as the Planer Saw. This method is given in detail on the preceding pages.

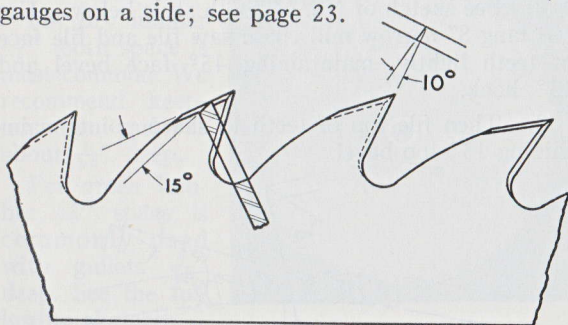


No. 54

Filing No. 60 Combination Saws

First, round, gum and set the saw as instructed on pages 17 to 24.

NOTE: If the saw is to be used on an electric hand saw machine, be sure to set the teeth $2\frac{1}{2}$ gauges on a side; see page 23.



Sketch P

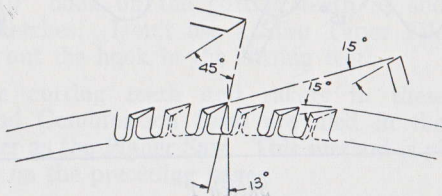
In filing, use an 8" "Red Tang" Mill Bastard File with 2 round edges. Use care to maintain the original hook, 10° face bevel, and 15° top bevel as shown in *Sketch P*, page 53.

Rounding a saw leaves a dull point which is very noticeable, so when filing, be very careful not to file below the blunt point left in rounding. File to bring to a point only because the slightest amount of filing thereafter will shorten the tooth and prevent it from doing its share of cutting and throw too much strain on the others.

Keep the gullets round. Use a "Red Tang" 8" or 10" Round Second-Cut File to clean out the gullets as sharp corners are the most frequent causes of cracks.

Filing No. 66 Plywood Combination Saws

1. Lightly round or joint saw.
2. See sketch of No. 66 tooth style below. Use red tang 8" narrow mill chain saw file and file face of teeth lightly, maintaining 45° face bevel and 13° hook.
3. Then file top of teeth to sharp point, maintaining 15° top bevel.



Smooth Trimmer Saws

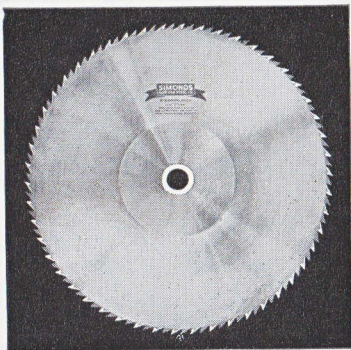
The Simonds Smooth Trimmer Saw is especially designed to cut off and trim smoothly. It is hollow ground for side clearance and the teeth have a 45° face bevel and plenty of hook to make a smooth, clean cut. When the saw is revolving at speed these teeth act like small knives and actually plane the ends of the lumber *while cutting off*.

The Simonds method of hollow grinding provides perfect clearance from the point of the tooth back, eliminating gumming and burning. It gives ample clearance for cutting all dimension lumber. An added feature of our Smooth Trimmer Saw is that it leaves no slivers or splinters on the bottom of the cut.

Tooth Spacing.

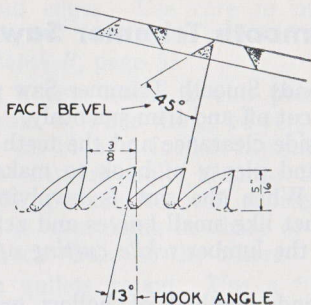
For dry lumber $\frac{3}{8}$ " tooth space is most common. We recommend keeping the gullets about $\frac{5}{16}$ " deep.

For green lumber $\frac{5}{8}$ " space is commonly used with gullets $\frac{7}{16}$ " deep. See the following sketches.

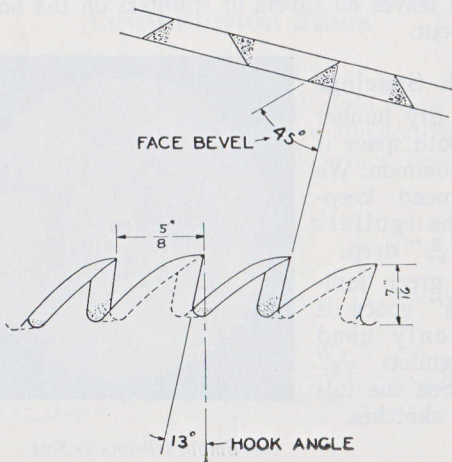


Smooth Trimmer Saw

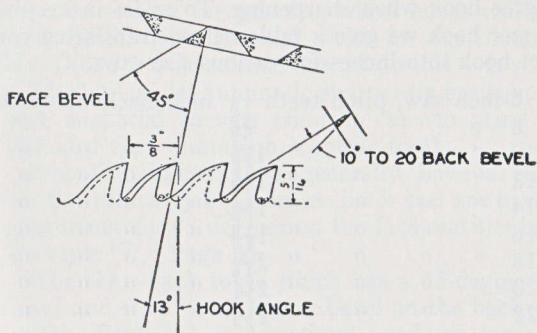
Style "P" — Round Back Tooth



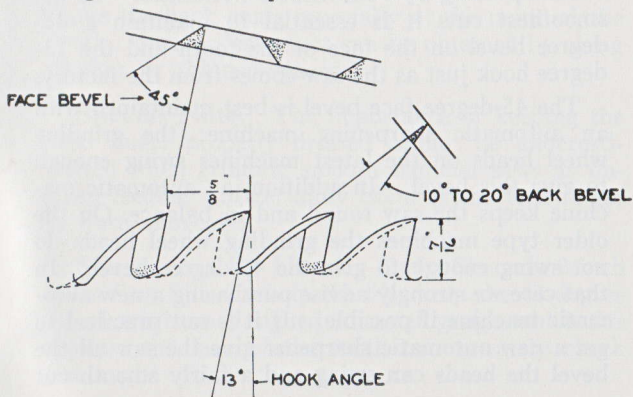
This is known as the round back smooth trimmer tooth. The round back gives more strength back of the point of the tooth. The face has a 45-degree face bevel and the back approximately the same.



Skew Back Tooth



This is known as the skew back smooth trimmer tooth. It is a round back tooth with a 45-degree face bevel but with only from 10 to 20-degree bevel on the back. This blunt bevel on the back of the tooth together with the round back gives even more strength back of the point of the tooth.



Hook. It is important to maintain at least a 13-degree hook when sharpening. To assist in keeping proper hook we give a table below, translating correct hook into inches for various size saws.

6-inch saw, pitch teeth $\frac{11}{16}$					inch back of center			
8	"	"	"	"	$\frac{29}{32}$	"	"	"
10	"	"	"	"	$1\frac{1}{8}$	"	"	"
12	"	"	"	"	$1\frac{3}{8}$	"	"	"
14	"	"	"	"	$1\frac{5}{8}$	"	"	"
16	"	"	"	"	$1\frac{11}{16}$	"	"	"
18	"	"	"	"	$2\frac{1}{16}$	"	"	"
20	"	"	"	"	$2\frac{1}{4}$	"	"	"
22	"	"	"	"	$2\frac{1}{2}$	"	"	"
24	"	"	"	"	$2\frac{3}{4}$	"	"	"
26	"	"	"	"	$2\frac{15}{16}$	"	"	"
28	"	"	"	"	$3\frac{3}{16}$	"	"	"
30	"	"	"	"	$3\frac{3}{8}$	"	"	"
32	"	"	"	"	$3\frac{5}{8}$	"	"	"

Sharpening by Automatic Machine. To get smoothest cuts it is essential to maintain a 45-degree bevel on the face of the tooth and the 13-degree hook just as the saw comes from the factory.

The 45-degree face bevel is best maintained with an automatic sharpening machine; the grinding wheel heads on the latest machines swing enough to give this bevel. In addition, an automatic machine keeps the saw round and in balance. On the older type machines the grinding wheel heads do not swing enough to give the 45-degree bevel. In that case we strongly advise purchasing a new automatic machine if possible. If it is not practical to get a new automatic sharpener give the saw all the bevel the heads can swing and a fairly smooth cut

can be obtained. These older machines can be re-modeled so that the grinding wheel heads will give more bevel. If interested, write for our blueprint No. G-620-1 which shows how to do this. It's free.

The late model automatic sharpeners are supplied with a special smooth trimmer cam to grind the standard type of smooth trimmer tooth.

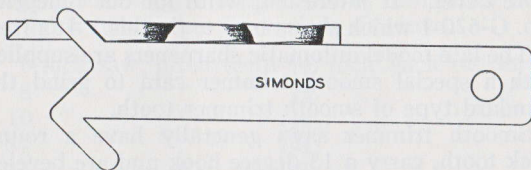
Smooth trimmer saws generally have a round back tooth, carry a 13-degree hook and are beveled approximately 45 degrees on the face and the back. See style "P," Page 56.

The skew back tooth which has a 45-degree face bevel and a 10 to 20-degree bevel on the back (see sketch, Page 57) is sometimes used for increased strength. This skew back tooth can be easily ground by inserting a $\frac{5}{8}$ " thick washer or spacer between the grinding wheel and the inside bearing, therefore throwing the grinding wheel off center in relation to the vertical spindle. The use of this spacer does not affect the 45-degree face bevel but reduces the back angle especially at the point of the tooth. More or less effect can be obtained by using thicker or thinner spacers.

Special Note. The importance of keeping the feed finger properly dressed cannot be underestimated when grinding smooth trimmer saws as uneven feeding will certainly occur if the feed finger is worn unevenly.

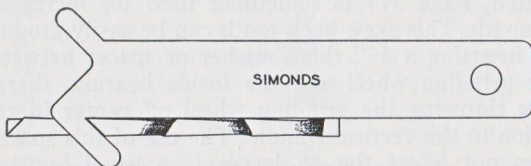
Sharpening by Hand. Use a Simonds 8-inch Cant Saw File. To help the filer keep the 45-degree bevel we have designed a metal gauge which fits against the face of the tooth to accurately check the angle.

The sketches show two ways of applying the gauge to check the 45-degree face bevel.



Sketch 1

The method shown in Sketch No. 1 (above) is handier on fine tooth saws.



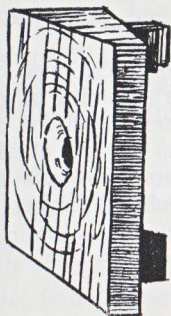
Sketch 2

Sketch No. 2 shows how to hold the gauge on coarser tooth saws.

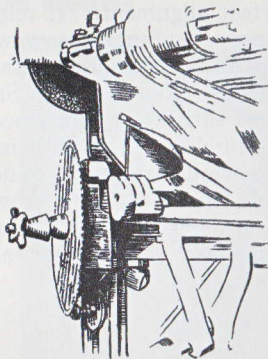
To get a correct check on the face bevel the gauge should be held at right angles to the face of the tooth.

When using a hand gummer to gum the gullets deeper it will often be found that the horizontal swivel support for the saw will not swing enough to give the necessary 45-degree bevel. In such cases a simple wooden block can be attached to the support which will allow saw to swing out to give 45-degree bevel on tooth face. *Sketch Q* shows the

block. *Sketch R* shows it in place on the horizontal support.



Sketch Q



Sketch R

To get good smooth trimming it is *necessary to have every tooth cut*. For this reason when saws are filed and gummed by hand be sure to round saws before and after gumming.

After sharpening on an automatic or hand gummer, use an oil stone to side dress just enough to remove burr from grinding.

Machines. Regardless of how well a saw is made, unless it is properly sharpened and the machine on which it operates is in good condition, the trimming will not be perfect.

The machine arbors should be straight, free from end play, bearings tight, collars accurately machined and balanced. To prevent setting up end play in the shaft on belt-driven machines the belts

should be laced straight, or, if cemented, not allowed to stretch unevenly. Keep lugs in feed chain in perfect alignment. If middle lugs are ahead of end lugs the lumber seesaws and jams, causing heating and bending of the saw.

Simonds "Red Center" Smooth Trimmer Saws are most satisfactory for smooth trimming of green or dry lumber. They are recommended for overhead sawmill trimmers, random length overhead multiple - saw automatic trimmers, two - saw trimmers, straight line cut-off machines, swing saw machines and regular saw tables.

CHAPTER X

Dado Heads

A Dado head is made up of two hollow ground outside saws, like those illustrated, in combination with one or more inside cutters or fillers, depending on the width of grooves desired. Grooves varying in widths by sixteenths up to four inches can be cut beyond the $\frac{1}{8}$ -inch and $\frac{1}{4}$ -inch cuts made by



one or both outside saws. The dado head cuts cleanly in any direction of the wood.

As suggested above, for grooves $\frac{1}{8}$ -inch wide, one outside cutter is used. This is mounted on the arbor exactly the same as a saw. Use both outside cutters for $\frac{1}{4}$ -inch grooves.

Do not place the ground parts of the cross cutting or fine teeth side by side so that they face in the same direction. Arrange the saws so that the raker on one saw is beside the cutting teeth on the other saw. This makes an easier running and smoother cutting head. See that this position is not changed when the cutters are tightened on the arbor.

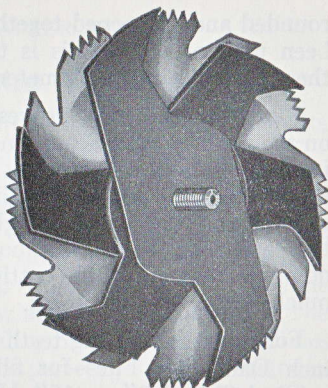
Use one $\frac{1}{16}$ " inside cutter in addition to the two outside cutters for grooves $\frac{5}{16}$ " wide. Put the inside cutter between the outside cutters, being sure that its two cutting edges come in line with the bottom of the spaces or gullets between the groups of teeth. The $\frac{1}{8}$ " and $\frac{1}{4}$ " inside cutters are swaged on their cutting edges and because of the greater width the swaged edge must enter the gullets before the dado can be properly tightened on the mandrel. It is essential to arrange the inside cutters properly so that the swaged part does not touch the outside cutters. If this is not done damaged cutters and oversize grooves result.

When wider grooves are desired, requiring more inside cutters, be certain to arrange the cutters evenly around the circumference and with their swaged cutting edges in line with the gullets of the outside cutters. Furthermore, do not permit the swaged edges of two inside cutters to come together as this keeps the cutters separated at the center and prevents proper operation.

If you wish to increase the width of the groove you want to cut very slightly, simply cut out a few paper washers and insert them between the outside saw and the swaged fillers. Cut these washers from tough paper, about $2\frac{1}{2}$ " in diameter. The swaged portion of the filler overlaps enough to allow a wide range of adjustment.

If you are grooving across the grain only and want to eliminate most of the fraying out at the end of the cut, build up to the width groove you want to make with one-sixteenth thick fillers only. Do not use thicker fillers.

This illustration shows a dado head with one outside cutter removed, showing the correct arrangement of the inside cutters.



Dado heads are operated in the same manner as a Circular Saw. Do not feed the work too rapidly, however. As the width and depth of grooves increase, the feed should be reduced.

Sharpening Dado Heads

When a dado head does not operate properly it is probably dull. If you force the feed, the head will heat and burn in the cut. This is a very dangerous condition as a dull dado head often throws the lumber back at the operator.

Sharpening a dado head requires considerable skill and if you are not experienced it is better to send the entire head to one of our service stations for refiling.

If you do wish to sharpen your own dado head, observe the following instructions:

First, round the entire head and all the fillers together by one of the methods described on pages 17, 18. Every time the head is sharpened both outside saws and all the fillers in the set should be

rounded and sharpened together whether they have been used or not. This is the only way to keep them all uniform in diameter.

Rounding the head leaves dull points or land on the teeth which are quite noticeable. Therefore, in filing, exercise the greatest care not to file below the blunt point left in rounding. File to bring to a point only because the slightest amount of filing thereafter will shorten the tooth, preventing it from doing its share of the cutting and throwing too much strain on the others.

For filing the cutting teeth use a "Red Tang" 10 inch Dado Saw File—for filing rakers and fillers a "Red Tang" 8" or 10" Mill Bastard File.

On the outside cutters or saws, file the cross-cut teeth with the same bevel as when the saw was received from the factory. File the raker teeth square across their faces, and keep them $1/64$ " lower than the cross-cut teeth. To regulate the height of the rakers use the No. 306 Raker Gauge as instructed on pages 48 and 49. In filing, take the same amount off each tooth, to preserve the balance of the saw; this may be done by counting file strokes.

On the inside cutters, or fillers, file the top of the teeth only. Do not touch the face of the teeth with the file except to remove the burr left when the tops are filed. The inside cutters, when placed on the arbor of the saw, should be the same length as the raker teeth on the outside cutters; that is, $1/64$ " shorter than the cutting teeth. As with the outside cutters, you should be careful to take the same number of file strokes on each side of an inside cutter to preserve the balance.

Glue Joint Rip Saws

How to sharpen Rip Saws to make glue joints direct from the Straight Line Rip Machine.

Care of Machine

The first important requirement for making glue joints direct from the rip saw is the condition of the machine itself. A Straight Line Rip Machine with a ball bearing saw arbor is recommended. The older type of babbitted or bronze bearing machines will not always produce perfect joints as demanded today.

Unless the machine is provided with adequate adjustments whereby wear can be compensated for, it cannot be expected to continue to do perfect work even though it did when new. The effect of wear on the parts must be guarded against in order to maintain true alignment. We would advise periodically checking the tracks for wear. If the machine is in use continuously for two shifts daily we would also suggest that the bearings on the motor be inspected once a year.

When a machine is kept in proper adjustment, operated with reasonable care and kept well lubricated, perfectly smooth and uniform glue joints can be produced continuously with a properly fitted Simonds "Red Center" Glue Joint Rip Saw.

Large Collars Essential

A great help in supporting the saw to produce smooth glue joints, is large collars which will sup-

port the saw practically into the cut. It is most desirable to have several sets of collars of different diameters enabling you to use the largest possible collars as the saw wears down. On machines with the saw arbor above the table, standard equipment generally consists of two supporting collars 7" diameter x $\frac{1}{8}$ " thick, 2—9" x $\frac{1}{8}$ ", and 2—11" x $\frac{1}{8}$ ". Some concerns also like additional collars 6" x $\frac{1}{8}$ ", 8" x $\frac{1}{8}$ " and 10" x $\frac{1}{8}$ ", enabling them to get the benefit of the largest collar diameter as the saw wears down.

Machines with the arbor below the table generally have stationary collars 7" or 8 $\frac{1}{4}$ " in diameter. Regardless of the fact that these are good sized collars, more support for the saw and a stiffer, truer running saw can be obtained by the use of large supporting collars. To use supporting collars on machines with the arbor below the table it is first necessary to move the motor back $\frac{1}{8}$ " (that is, the thickness of the supporting collar so that the saw will still come in the middle of the feed chain.) Then stiffening collars 11" diameter x $\frac{1}{8}$ " thick, 10" x $\frac{1}{8}$ ", and 9" x $\frac{1}{8}$ " can be used.

Keep Saws Clean

Do not allow your saws to accumulate gum or pitch on the sides. This may cause them to run warm and snake. The best method of removing hardwood gum from the sides of the saw is to soak the saw in hot water for a few minutes then wipe with a rag. The saw will then be bright and clean.

Never scrape off gum with a sharp tool. It is apt to scratch the saw and it will gum up that much quicker.

Specifications of Saws

The specifications of Glue Joint Rip Saws vary, but the most common are 14" diameter x 12 gauge x 30 and 36 teeth, set and filed and 12" diameter x 12 gauge x 24 teeth, swaged. For the specifications of Glue Joint Rip Saws which we carry in stock for immediate shipment see pages 102-103.

Setting the Teeth

The first operation in fitting Glue Joint Saws is setting the teeth. For this operation we recommend a special glue joint saw set which we stock. This is similar to the saw set illustrated on page 22, but it is made especially for Glue Joint Saws and has pins in the anvil to help get even, uniform set. The glue joint saw should be run with as little set as will nicely clear the blade. Not less than $1/64$ " nor more than $1/32$ " on a side is recommended. For kiln dried maple .020 on a side is recommended. Too much set will tend to allow the saw to run too freely in the cut, causing it to cut rough. Do not extend the set more than $3/16$ " down from the point of the tooth. Setting farther down than this will cause the tooth to vibrate in the cut. Set the teeth as uniformly as possible by striking four or five light even blows. Do not try to set the teeth by striking just one hard blow. An even uniform set is most essential for glue joint work. As the least amount of set will give the smoothest cut, this means that the saw should be checked for set after every other filing, otherwise the saw will burn.

As a result of setting, the face of the teeth are not square. Take a Simonds "Red Tang" 8" Mill

Bastard File with two round edges and file the *face of the teeth only*. Be sure to use a file with two round edges. A regular mill file will leave nicks in the gullets and cause cracks. In general the glue joint saw should be filed *straight across* the face of the teeth. However, when cutting stringy wood such as cottonwood or elm a 5 degree face bevel will assist in severing the fibers and making a cleaner cut. Then replace the saw on the machine being sure to observe the instructions for mounting on the arbor.

Mounting Saw on Arbor

Caution: The saw should always be put back on the arbor in the same position to insure a round true running saw. Before you take the saw off, turn the arbor so the etched trade-mark on the saw is directly above the arbor, and then make a mark on the arbor right below the etched trade-mark to indicate that that side of the arbor was up when you took the saw off. Then when replacing the saw on the arbor after sharpening, be sure to turn the arbor so that the mark is up and then place the saw on the arbor with the etched trade-mark directly over the mark on the arbor.

If the collar has a pin the same thing applies. Always put the saw on with the pin down and directly below the arbor. This takes care of a little looseness which may be present.

Before placing the saw in the machine, be sure both the saw and collars are free from dust and dirt which will prevent the saw from running true.

Rounding

For the glue joint saw to produce smooth work every tooth must do its part and that means that the saw must be perfectly round. The next operation in sharpening is to round or joint the saw right on the machine while the saw is running at full speed. An easy way to round the saw is to

1. Place the saw on the machine in accordance with the instructions in the paragraphs on mounting saws on arbor.
2. Take a flat, square piece of hard wood a little thicker than the distance the saw projects above the table.
3. Place an Abrasive Vitrified Medium Jointer Stone 1 x 2 x 6 on top of the piece of wood so that one end of the stone will project over the saw.
4. Hold the stone tightly and let another operator raise the saw until the points of the teeth lightly touch the Jointer Stone.

Another way is to take the Abrasive Jointer Stone, place it on the feed chain and press it lightly but firmly against the points of the teeth until all of the teeth show a small dull spot or land on top. Be sure to hold the stone square to the saw. To check if the stone has been held correctly, check the land with a square. The land on top should be at right angles to the side of the saw. Then take the saw off to finish the fitting.

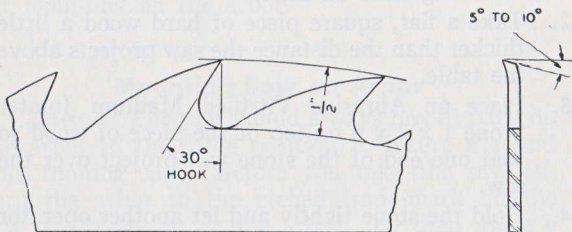
Filing

In filing use only a Simonds "Red Tang" 8" Mill Bastard File with two round edges. Use care to

maintain original hook, shape, and angle of the tooth. In order to do this it is necessary that the same amount of filing be done on the back as you have already done on the front.

The glue joint rip saw is generally filed with a slight bevel of from five to ten degrees on the back of the tooth; however *some prefer the back filed straight across*.

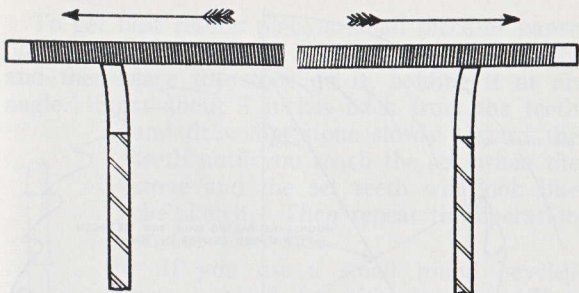
The following illustration shows a good tooth for glue joint work.



Sketch S

NOTE: When filing the backs of rip saw teeth, do not file each successive tooth on the back. See *Sketch I*, Page 73.

File every other tooth on one side all around the saw filing with the set and then reverse the saw in the vise and go back and file every other tooth on the opposite side, filing with the set. See *Sketch I* on page 73. For example: File all the teeth which are set on the left hand side, then reverse the saw in the vise. Go back and file only the teeth set on the right hand side. This is the only way to file the backs uniformly whether you prefer the backs filed straight across or filed with



Sketch I

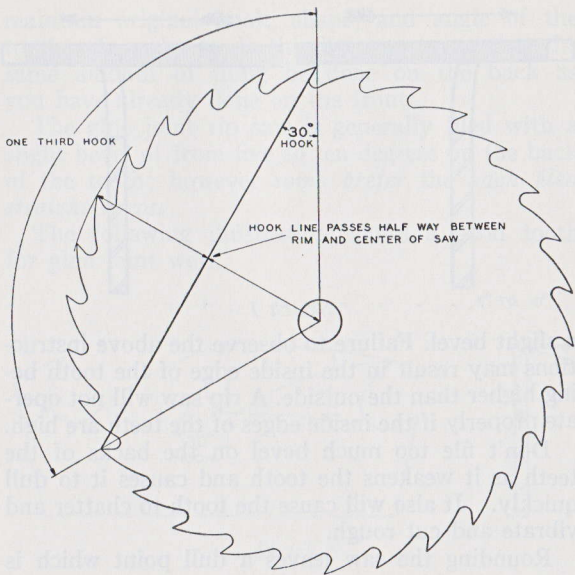
a slight bevel. Failure to observe the above instructions may result in the inside edge of the tooth being higher than the outside. A rip saw will not operate properly if the inside edges of the teeth are high.

Don't file too much bevel on the backs of the teeth as it weakens the tooth and causes it to dull quickly. It also will cause the tooth to chatter and vibrate and cut rough.

Rounding the saw leaves a dull point which is very noticeable, so when filing be very careful not to file below the blunt point left in rounding. File to bring to a point only because the slightest amount of filing thereafter will shorten the tooth and prevent it from doing its share of cutting and throw too much strain on the other teeth.

Hook

For the glue joint rip saw to cut fast and easily the teeth should be hooked so that a line along the face of the tooth or front of the tooth will pass half way between the center and the rim. (See *Sketch J*), Page 74.

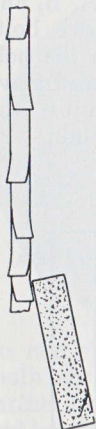


Sketch J

Side Dressing

After filing go over the teeth with an oil stone to remove the burr from gumming and filing or else take a piece of hardwood and lightly tap the point of each tooth which will remove the burr. Then replace the saw on the machine being sure that the etch on the saw is directly over the mark on the arbor or if the collar has a pin the pin is directly below the arbor. Then start the saw and side dress the teeth lightly with a Simonds Abrasive Vittrified Medium Jointer Stone 1 x 2 x 6.

To get best results place a small piece of paper on the feed chain so that the stone can slide easily and then place the stone on it, holding it at an angle. Start about 3 inches back from the teeth and draw the stone slowly toward the teeth until you reach the set, when the stone and the set teeth will look like the sketch. Then repeat the operation on the other side.



If you use a small round beveled emery wheel for side dressing follow exactly the same procedure.

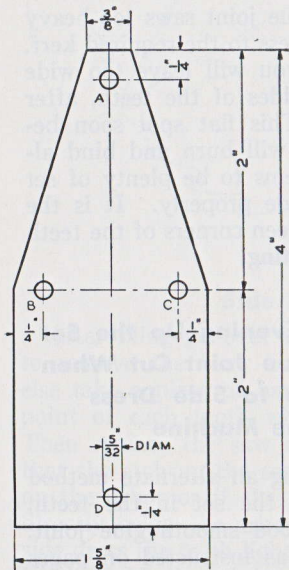
Do not set glue joint saws too heavy and then side dress to the required kerf. By doing this you will leave too wide a spot on the sides of the teeth, after side-dressing. This flat spot soon becomes dull and will burn and bind although there seems to be plenty of set to clear the blade properly. It is the extreme sharp, keen corners of the teeth that do the cutting.

Alternate Method of Evening Up the Set to Make a Smooth Glue Joint Cut When It Is Not Desirable to Side Dress the Saw on the Machine

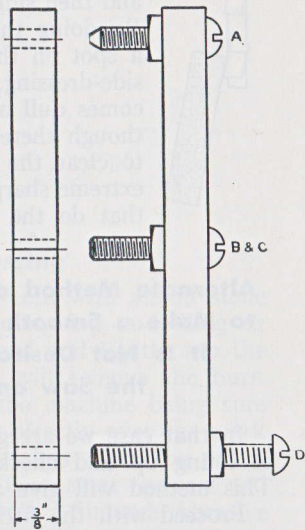
In that case we are giving an alternate method of lining up and checking the set in the teeth. This method will give a good smooth glue joint.

Proceed with the fitting as instructed on pages 69, 70, 71, 72 and 73 up to side dressing. Be sure to

hammer set the teeth using anvil and stake. Go over the sides of the teeth with an oil stone to remove all the burr. Then make a side gauge to check the set. Take a piece of hardwood $\frac{3}{8}$ " thick x 4" long x $1\frac{5}{8}$ " wide and shape it to sketch and drill 4 $\frac{5}{32}$ " holes. Then in the holes marked A, B, and C, insert (3) $1" \times \frac{3}{16}"$ round head stove bolts with a nut on the bottom as shown. In the hole marked "D" insert a $1\frac{1}{2}" \times \frac{3}{16}"$ round head stove bolt with a nut on top as shown. Adjust the screw "D" to give the set you wish to obtain.

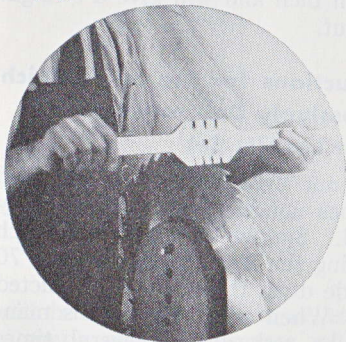


Side Gauge Plan



Finished Gauge

Be sure to file the bottom of screw A, so that it is about $3/64$ " diameter and so that the bottom is perfectly flat and parallel with the face of the gauge. A side view of the finished gauge is shown on page 76.

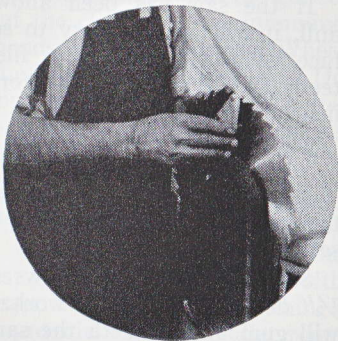


Place the saw in the filing vise and go around the saw with a No. 304 saw set (*See photo at left*) bending the teeth very slightly sideways until every tooth point just touches the gauge. (*See photo below*).

In this instance

do not place the saw set directly on top of the tooth nor use the finger stop. Place the saw set farther down on the top of the tooth as illustrated and bend the tooth sideways.

Caution: There is a slight spring-back to the teeth so it is necessary to *go around the saw a second time* checking each tooth again to the gauge and bending those necessary to line them up. After



going over the teeth the second time, if the lining up and checking was done carefully as directed, all the points of the teeth will just touch the gauge and the teeth will be set uniformly within plus or minus one-thousandth of an inch and will give a straight smooth glue joint cut.

Sharpening Instructions for the Saw Which Is Not Excessively Dull and Has Not Lost Its Set

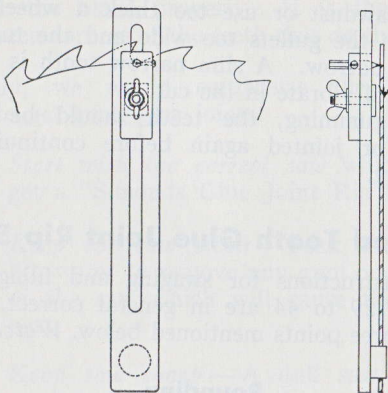
A saw which is not excessively dull and still has sufficient set does not have to be reset every time it is sharpened. Simply round or joint such a saw lightly following the instructions on page 70 and then file and side dress the teeth as instructed in pages 71 to 75. When cared for in this manner, the saw may be resharpened several times before it is necessary to reset it. However, be sure to check the saw for set before rounding or jointing. Too little set will cause the saw to heat and burn.

If the saw has been allowed to become very dull, it will be necessary to set the teeth, file the face of the teeth, joint, file the backs of the teeth and side dress in accordance with previous instructions.

Gumming

After repeated filings, it is necessary to gum the teeth deeper. This should be done before setting.

Sketch S, page 72, shows a good tooth, about $\frac{1}{2}$ " deep, for glue joint work. To insure that you will gum all the teeth the same depth so the saw



will be in balance, it is an easy matter to make a simple wooden compass with a round piece of wood to fit in the centerhole of the saw. See *Sketch*. Drill a hole to hold a blue pencil and describe a circle the proper distance below the teeth. Then gum until the bottom of all the gullets just touch the edge of the circle. When gumming we recommend a Simonds Abrasive Resinoid Wheel A 369-N-B. Go around the saw several times. Do not do too much work at one time and take too deep a cut. This will burn and blue the gullets and small cracks will start from these hard spots.

Doing too much work at one time will heat and stretch the rim so that saw will need re-hammering to restore it to its original tension. When the abrasive wheel glazes, gums or fills, dress it with an emery wheel dresser. Do not use too thin a wheel which will not provide sufficient gullet room

for the sawdust or use too thick a wheel which will make the gullets too wide and the tooth too slim and narrow. A slim narrow tooth is sure to chatter and vibrate in the cut.

After gumming, the teeth should be lightly rounded or jointed again before continuing the sharpening.

Swaged Tooth Glue Joint Rip Saws

The instructions for swaging and filing found on pages 29 to 44 are in general correct, except for the three points mentioned below. *Watch these.*

Rounding

The swaged tooth glue joint rip saw like the set tooth glue joint rip saw should be rounded on the machine.

Swaging

A glue joint saw should be run with $2\frac{1}{2}$ gauges swage on each side.

Side Dressing and Side Filing

After swaging, shaping and filing, the swage should be side filed to a side gauge or the saw side dressed on the machine in the same manner as the set tooth saws. Do not swage the glue joint saw too heavy and then side dress to the required kerf. By doing this you will leave too wide a spot on the sides of the teeth after side dressing. This flat spot soon becomes dull and will burn and bind although there seems to be plenty of swage

to clear the blade properly. It is the extreme sharp, keen corners of the teeth that do the cutting.

Finally, we would emphasize the following points to get good glue joints:

- (1) *Start with the correct saw* which means get a "Simonds Glue Joint Rip Saw."
- (2) *Keep the saw clean* — Soak the saw in hot water to remove any gum on the sides of the saw which will cause the saw to heat.
- (3) *Keep saw sharp* — A dull saw will not produce cleanly cut lumber, will heat and injure the saw, will take more power and will put undue strain on the machine. The length of time that the saw can be used depends entirely on the stock you are cutting. The harder the wood the quicker the saw will become dull. You will get much better work and much longer life from your saw blade by using the saw a few hours and then sharpening it when it is dull than by running it until it becomes excessively dull. The dull saw will not cut smoothly and will make it necessary for the filer to remove considerably more metal to bring the very dull saw back in shape than if it were sharpened oftener.
- (4) *Keep saw round* — Each tooth must do its share of the cutting to produce smooth glue joints.

- (5) *Careful filing* — Beware of filing too much bevel on the backs of the teeth. Also be careful not to file more bevel on one side of the teeth than the other. Be sure the teeth have enough hook and are about $\frac{1}{2}$ " deep.
- (6) *Even uniform set or swage* — An even set or swage is necessary for smooth straight work. In addition, the teeth must be side dressed on the machine or else lined up and checked twice with a side gauge as instructed.
- (7) Keep machine well lubricated and in perfect alignment.

How to Sharpen Mitre Saws

Filing Mitre Saws: First round the saw in accordance with the instructions on pages 17 and 18.

In filing use a Red Tang 6", 7" or 8" Slim Taper thin edge file. Use care to maintain the original bevel, hook and angle of the tooth and keep the face of the teeth pitched to the center of the saw. The teeth should be uniform in width and shape and the gullets of equal width and depth. Every tooth should have the same amount of bevel; about 12° to 15° is generally recommended.

Rounding a saw leaves a dull point which is quite noticeable, therefore in filing exercise the greatest care not to file below the blunt point left in rounding. File to bring to a point only, because even the slightest amount of filing thereafter will shorten the tooth, thereby preventing it from doing its full share of cutting and throwing too much strain on the others.

Causes of Cracks in Circular Saws

Saw cracks, a source of great inconvenience and annoyance, are generally caused either by inaccurate specifications, improper saw application or by conditions which can be corrected.

The most common cause of cracked saws is:

(1) *Running Dull Saws*

In many plants today, the emphasis is more and more on increased production. Consequently the plant foreman or machine operator will not take time out during the regular shift to shut down machines and change saws when they become dull. Dull saws heat up, the rim expands and cracks result. When you have conditions like this and can't get saws changed when dull, the best solution is to put expansion or relief slots in the saws.

Other reasons that cause cracking:

- (2) *Saws Too Thin for the Particular Job They Are Doing*
- (3) *Saws Having Too Many Teeth for the Job*
- (4) *Collars Too Small*
- (5) *Arbor Sprung*
- (6) *Bearings Worn*
- (7) *Incorrect Tension*
- (8) *Feed Chain Lugs Out of Line on Power Feed Trimmers and Double End Tenoners*
- (9) *Improper Sharpening by Customer:*
 - (A) *Saws Out of Round*

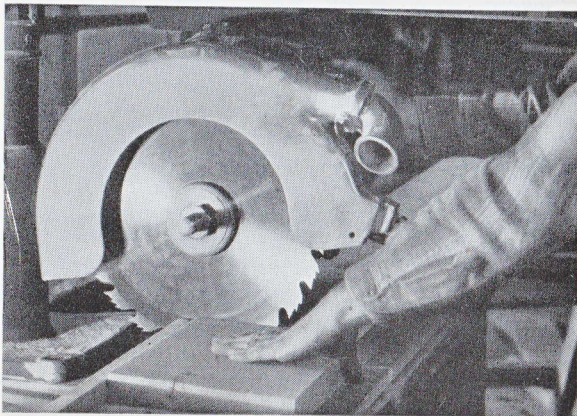
(B) *Improper Set or Swage—Not Enough Set or Swage—too much Set or Swage—Uneven Set or Swage*

(C) *Gullets Case Hardened by Improper Grinding*

(D) *Improper Tooth Shape—Square Corners in Gullets — Teeth Too Deep — Too Much Hook — Not Enough Hook*

Another common cause of cracked saws is the **WRONG APPLICATION OF CUT-OFF SAWS** for certain jobs and on certain machines.

A good example of this is the Radial Arm Machine (See Illus. below) such as manufactured by DeWalt, Skilsaw, Delta Multi-Plex, Comet, etc.



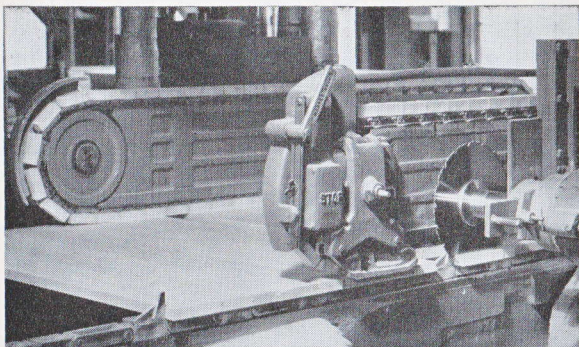
For cutting off on Radial Arm Machines, the proper saw is Simonds No. 52 Flat Ground Combination Saw. The cutting action, plus the high rim

speed of these machines puts a terrific strain on the rim of the saw blade causing regular Cut-Off Saws to crack.

The raker gullet in Simonds No. 52 Combination Saw acts as a natural expansion slot. Consequently, this saw will cut freely, easily, and will not crack.

Those who prefer to use Cut-Off Saws because the teeth can be sharpened on automatic filing machines, should be sure to have the saws furnished **WITH EXPANSION SLOTS.**

Another application where regular Cut-Off Saws are not recommended is on Double End Tenoners such as made by Greenlee, C.K.L. and other manufacturers. (See Illus. below.)



For Double End Tenoners Simonds No. 54 Flat Ground Combination Saw is recommended. This saw has 4 cutting teeth and 1 raker per section and will give a moderately smooth cut and will not crack if heat develops when sawing. Cut-Off Saws can be used but should have expansion slots.

Expansion or Relief Slots

As has been mentioned, a good corrective method to eliminate cracks on tough jobs, is to put 3, 4 or 5 expansion slots in the rim of the saw to relieve rim strain and help dissipate heat. Expansion slots are usually $\frac{1}{16}$ " wide, are evenly spaced to preserve perfect balance, and should be cut in parallel to the hook line. (See Illus. below.)



The standard slot depth is:

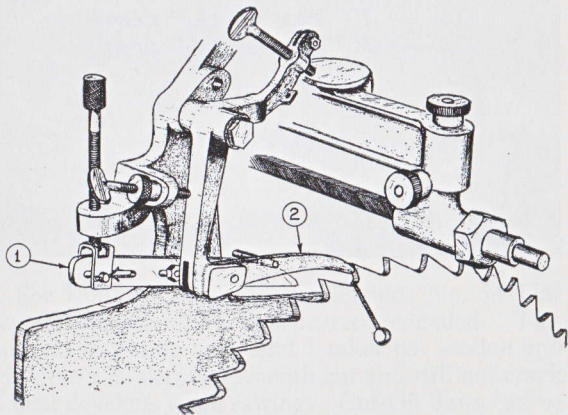
	8"	Saw	—	$\frac{3}{4}$ "	deep
10"	—	12"	Saw	—	1 " deep
14"	—	20"	Saw	—	$1\frac{1}{4}$ " deep
22"	—	30"	Saw	—	$1\frac{1}{2}$ " deep

How to Prevent Feed Finger from Sticking When Automatically Gumming and Automatically Filing Circular Saws with Expansion Slots

When automatically sharpening Circular Saws with expansion slots, the feed finger occasionally causes trouble by sticking in the slot.

This can be eliminated in the following manner:—

A—To stop feed finger sticking when *filing Cut-Off Saws on automatic filing machines*, see Illus. A, below, which shows proper feed finger and indexing set up on automatic filing machine.

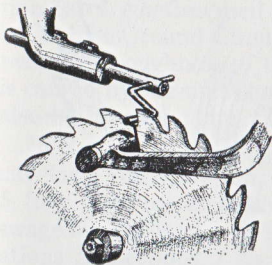


Illus. A

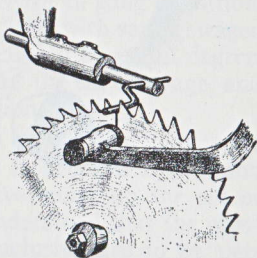
NOTE — The filing machine should be equipped with a feed finger rest. (See "1" in Illus. A, pg. 88). This finger rest should be adjusted high enough so the bottom of the feed finger does not touch the bottom of the gullet when indexing and feeding. The feed finger contact should be half way down the tooth. With the set-up described, there will be no chance of the feed finger sticking in the slot.

Also, for best results, the feed finger should have a blunt rounded end, (See "2" in Illus. A, pg. 88). It should not be sharp.

B—To stop feed finger from sticking on *automatic gummers* when sharpening Rip Saws and Coarse Tooth Cut-Off Saws, use a round feed finger with the feeding end of feed finger not less than $\frac{1}{4}$ " diameter. (See Illus. B and C below). Be sure to maintain this diameter and this round shape and replace finger when worn too much. If the edge of the finger is allowed to become sharp, it is that sharp thin edge which sticks in the relief slot. The larger diameter round finger will not stick.

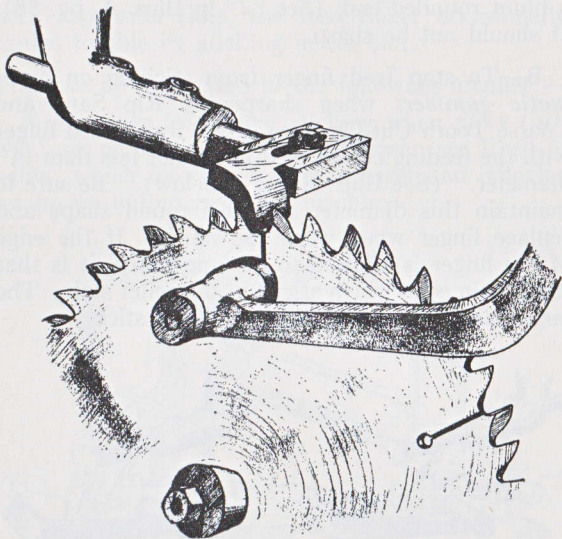


Illus. B



Illus. C

C—To stop feed finger from sticking on *automatic gummers* when sharpening Smooth Trimmers and Finer Tooth Cut-Off Saws, use a special shaped feed finger with a blunt rounded end. (See Illus. D below). Do not allow feeding end of feed finger to become sharp and as the end wears, reshape it to its original round. If the end is allowed to become sharp, it will stick in the relief slots.



Illus. D

How to Get Smoother Saw Cuts

More and more woodworking plants today want smoother cuts from their circular saws. A good, smooth cut, whether with or across the grain, improves the appearance of the finished product, saves money by eliminating sanding and planing operations, and in the case of Glue Joint Rip Saws, saves lumber as well.

Smoother cuts can be obtained by using the different types of saws in Simonds complete line of smooth cutting Hollow Ground Saws. These include Planer Saws, Novelty Saws, Smooth Trimmer Saws, Hollow Ground Cut-Off Saws, Mitre Saws, Groover Saws, End Matcher Saws and Dado Heads. For smooth glue joint ripping on straight line rip machines, Simonds Glue Joint Rip Saw is highly recommended.

The following suggestions will help produce the best possible cutting results from Flat Ground, Set and Filed or Swaged Rip, Cut-Off, and Combination Saws, whether used singly or in gang operation.

On Flat Ground Circular Saws with set or swaged teeth, the roughness of the cut, to a certain degree, is caused by the unevenness of the set or swage, and also by excessive rim vibration.

In Section 1, there is an explanation of how to cut down rim vibration, and in Sections 2, 3, 4 and 5 four different methods of evening up the set or swage are outlined. It is understood that the operations in Sections 2 to 5 inclusive are to be performed after the saws have been jointed for round-

ness and set and filed or swaged in the regular manner.

After rim vibration has been eliminated, and the set or swage evened up perfectly, smoother sawing will result.

How to Cut Down Rim Vibration

The performance of any Flat Ground Circular Saw or gang of Circular Saws can generally be improved, as far as smoothness and straightness of finished cut is concerned, by INCREASING THE COLLAR SIZE or by the addition of larger diameter $\frac{1}{8}$ " thick STIFFENING COLLARS.

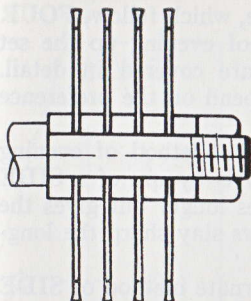
It is a well known fact that the larger the saw collars are in diameter, the nearer the rim the saws are supported. Consequently, the truer the saws will run and the smoother and straighter the saws will cut, due to the elimination of rim vibration.

Sawing conditions can generally be improved by going over each machine and making certain that the largest possible diameter collars are supporting the saws in every case.

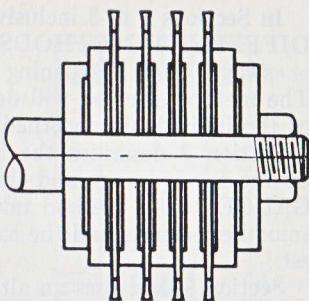
Illustration "A" (page 93) shows a Rip Saw gang with small collars. This makes for a poor operating condition with excessive rim vibration present.

Illustration "B" shows a Rip Saw gang with large collars. This is the first step toward getting smoother, straighter sawing.

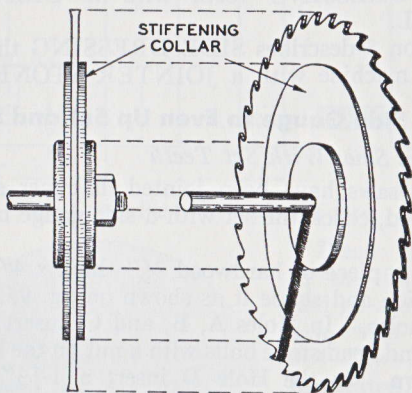
Illustration "C" shows a Circular saw operation where additional support has been given to the small diameter saw collars by LARGE DIAMETER $\frac{1}{8}$ " THICK STIFFENING COLLARS.



Illus. A



Illus. B



Illus. C

Many concerns find it desirable to have several sets of collars of different diameters for the same machine, enabling them to obtain the maximum amount of support as the saws wear down.

In Sections 2 to 5 inclusive, which follow, **FOUR DIFFERENT METHODS** of evening up the set or swage after sharpening are covered in detail. The method selected will depend on the preference of the individual concerned.

Section 2 describes the best method of evening up the set or swage and that is by use of a **SIDE GAUGE**. This method takes longer but gives the smoothest results and the saws stay sharp the longest.

Section 3 describes an alternate method of **SIDE FILING** teeth.

Section 4 describes another alternate method of **SIDE DRESSING** teeth with a **GRINDING WHEEL**.

Section 5 describes **SIDE DRESSING** the teeth on the machine with a **JOINTER STONE**.

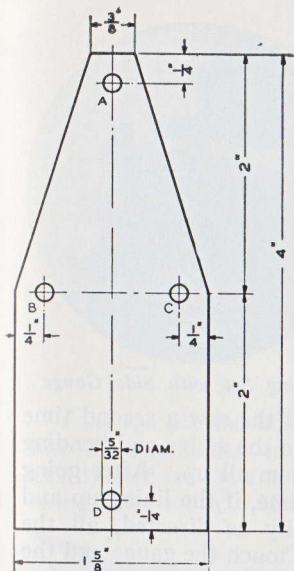
Use of Side Gauge to Even Up Set and Swage

A — On Saws With Set Teeth

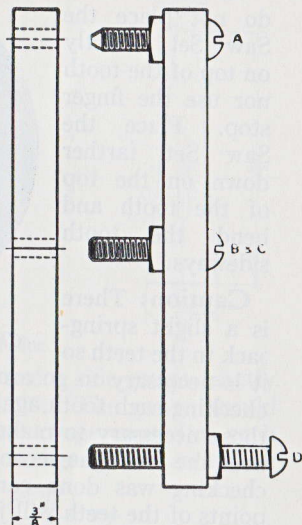
After saws have been jointed, hammer set and sharpened, check the set with a side gauge made as follows:

Take a piece of hardwood $\frac{3}{8}$ " thick x 4" long x $1\frac{5}{8}$ " wide and shape it as shown on pg. 95. Drill $4-\frac{5}{32}$ " holes. In Holes A, B, and C, insert $3-1" \times \frac{3}{16}$ " round head stove bolts with a nut on the bottom, as shown. In the Hole D insert a $1-\frac{1}{2}" \times \frac{3}{16}$ " round head stove bolt with a nut on top as shown. Adjust Screw D to give the set you wish to obtain.

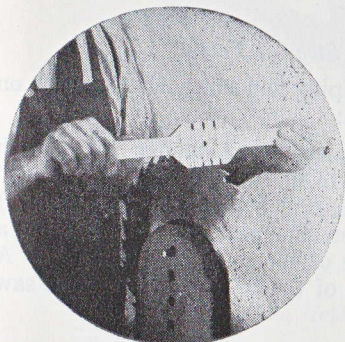
Be sure to file the bottom of Screw A, so that it is about $\frac{3}{64}$ " diameter and the bottom is perfectly flat and parallel with the face of the gauge. A side view of the finished gauge is shown on pg. 95.



Side Gauge Plan

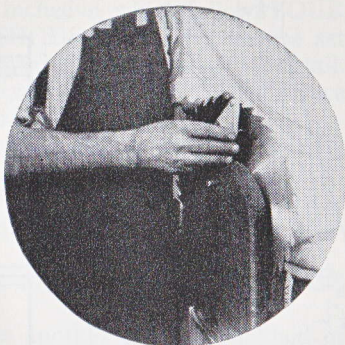


Finished Gauge



Place the saw in the filing vise and go around the saw with a No. 304 Saw Set (as illustrated) bending the teeth very slightly sideways until every tooth point just touches the gauge just described.

In this instance, do not place the Saw Set directly on top of the tooth nor use the finger stop. Place the Saw Set farther down on the top of the tooth and bend the tooth sideways.



Checking Set with Side Gauge

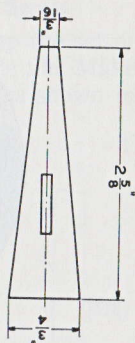
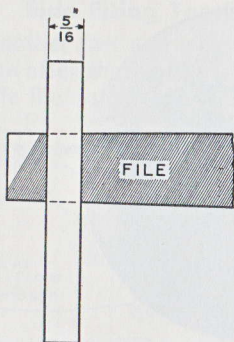
Caution: There is a slight spring-back to the teeth so

it is necessary to go around the saw a second time checking each tooth again to the gauge and bending those necessary to make them all up. After going over the teeth the second time, if the lining up and checking was done carefully as directed, all the points of the teeth will just touch the gauge and the teeth will be set uniformly and give a much smoother cut than formerly.

B — *On Saws With Swaged Teeth*

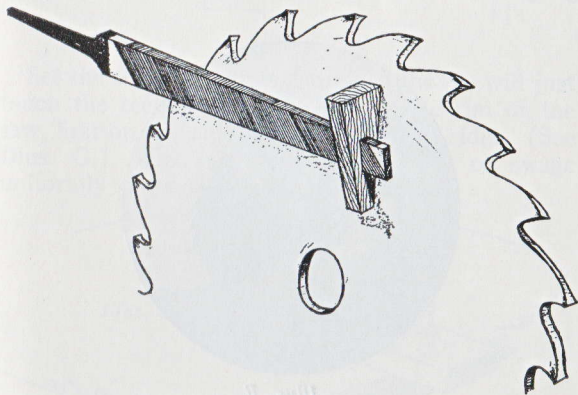
After swaging, shaping and filing, file the teeth on the sides, as follows:

First, make a simple tapered wooden holder with a slot in the middle to fit the end of an 8" or 10" "Red Tang" Mill Bastard File. (See Illus. pg. 97.) By using this holder, the possibility of leaving a flat spot on the side of the teeth is eliminated. A flat spot on the side of the teeth will cause the saw to dull faster.

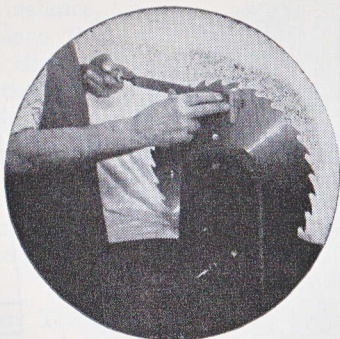


File Holder.

Take the file and holder and a side gauge exactly like the one shown on pg. 95. The gauge should be adjusted for the amount of swage wanted on each side of the tooth. About two gauges of swage on



Position of File Holder on Saw



Illus. D

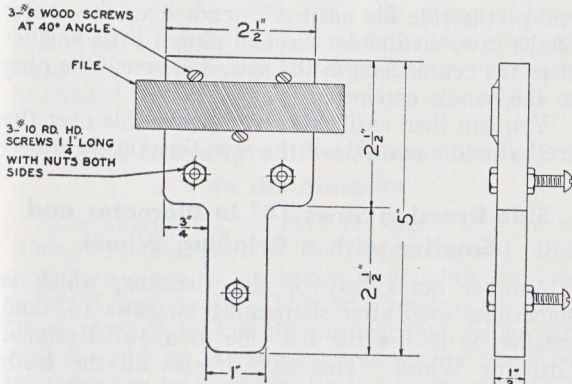
each side is generally used. Then take the file and side file each tooth until the point just touches the gauge. (See Illus. D and E.)



Illus. E

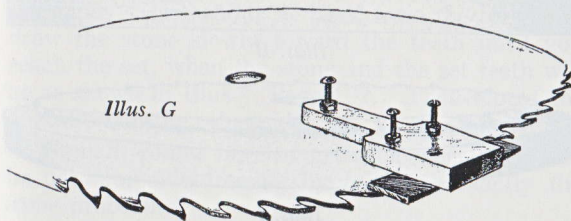
Side Filing Teeth of Circular Saws

Another fast and easy way to even up the set or swage after sharpening is by use of a side file. Make a side file out of $\frac{1}{2}$ " thick hard wood as shown in Illus. F.



Illus. F

Set the three adjusting screws so the file will just touch the teeth. Then go around the rim of the saw, first on one side then on the other side. (See Illus. G.) This will even up the set or swage uniformly on each side of the saw.



Illus. G

The side file shown in Illus. G can be used for all diameters of Circular Saws, both large and small.

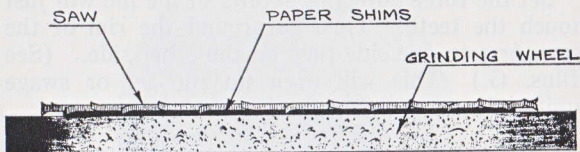
For saws of only one diameter, a rig to side file easier and faster can be made as follows:

Make an attachment to lengthen out the handle end of the side file until it extends over the center of the saw, then make a round plug a little smaller than the center hole in the saw, and screw the plug to the handle extension.

You can then easily revolve the side file over the teeth, first on one side of the saw, then on the other.

Side Dressing Saws 14" in Diameter and Smaller with a Grinding Wheel

Another quick way of side dressing, which is sometimes used after sharpening for saws 14" and smaller, is to use the flat side of a 16" Resinoid Grinding Wheel. This side dresses all the teeth on one side of the saw at a time. (See Illus. H and I.)



Illus. H



Illus. I

Lay the grinding wheel flat on the table. Cover the center of the wheel with several round pieces of paper a little smaller than the diameter of the saw to be side dressed. The total thicknesses of the paper to be just a little less than the amount of set on one side of saw. Place the saw on top of paper and revolve lightly. Then turn the saw over and repeat the operation. Any high points on the set or swaged teeth will be removed.

Side Dressing with a Jointer Stone on the Machine

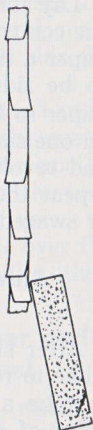
After sharpening, go over the teeth with an oil stone to remove the burr from gumming and filing, or take a piece of hardwood and lightly tap the point of each tooth. This will remove the burr. Then replace the saw on the machine, being sure that the etch on the saw is directly over the mark on the arbor or, if the collar has a pin, the pin is directly below the arbor. Then start the saw and side dress the teeth lightly with a Simonds Abrasive Vitrified Medium Jointer Stone 1" x 2" x 6".

To get best results, place a small piece of paper on the saw table top so that the stone can slide easily and then place the stone on it, holding it at an angle. Start about 3" back from the teeth and draw the stone slowly toward the teeth until you reach the set, when the stone and the set teeth will be as shown in Illus J, Page 102. Then repeat the operation on the other side.

A small, round beveled grinding wheel can also be used for side-dressing by following exactly the same procedure.

Do not set saws too heavy and then side dress to the required kerf. By doing this you will leave too wide a spot on the sides of the teeth, after side-dressing. This flat spot soon becomes dull and will burn and bind although there may seem to be plenty of set to clear the blade properly. It is the extremely sharp, keen corners of the teeth that do the cutting.

Illus. J



General Rules for Selecting Saws

The proper selection of a saw depends on the thickness of the material you will cut, whether it is green or dry stock, and whether you have a hand feed saw table or a power feed machine. On Rip and Cut-off Saws you will notice that in many items we stock several different thicknesses and several different numbers of teeth to take care of a great variety of needs.

For selecting the proper thickness Rip or Cut-off saw.

For ordinary work on a saw table (hand feed) the standard thickness (shown in heavy black type) is recommended.

For cutting green wood or for cutting very thick lumber we recommend a heavier gauge than standard.

For power feed and self fed machines we recommend heavier gauges than standard.

For selecting the proper number of teeth in Rip or Cut-off saws.

For ordinary work on a saw table (hand feed) the standard number of teeth (shown in heavy black type) is recommended.

For very thick material or for green lumber coarser teeth than standard are recommended.

For power feed machines we recommend coarser teeth than standard. The faster the feed the coarser the teeth should be.

For cutting thin stock we recommend the saws with finer teeth.

If you want a saw for a special job write us and tell us just what your job is. Give us all the information about the job you can, including the kind of wood you wish to cut, the maximum thickness of this wood, whether it is green or dry, speed of the arbor, hand or power feed and if power feed the rate of feed in feet per minute. Then you will get a saw that is right.

The Average Speed of Circular Saws

<i>Diameter Inches</i>	<i>Revolutions per Minute</i>	<i>Diameter Inches</i>	<i>Revolutions per Minute</i>
8	5,700	36	1,275
10	4,570	40	1,150
12	3,810	44	1,040
14	3,270	48	955
16	2,900	52	880
18	2,550	56	820
20	2,290	60	765
24	1,910	64	715
28	1,640	68	675
32	1,430	72	635

The above table is figured on a rim speed of 12,000 feet per minute.

To determine the rim speed of a saw when revolutions per minute are given use the following rule:

$$\frac{3.14 \times \text{Diameter in inches} \times \text{R. P. M.}}{12} = \text{Rim Speed in feet}$$

Saws for Immediate Shipment

Your orders for any of the saws in the following lists are filled from stock. The bold face type shows those most commonly used.

Rip Saws

Diam.	Gauge	Teeth	Diam.	Gauge	Teeth
6"	18	36	18"	12	30-36
7	18	36	18	13	30- 36
8	14	24	20	7	30
8	18	36	20	8	24
9	16	36	20	9	30
10	12	24-30	20	12	36
10	13	30	20	13	36
10	14	30-36	22	7	30
10	16	36	22	12	36
12	10	24	24	7	30
12	12	24-30-36	24	8	30
12	13	20-24-36	24	10	36
12	14	24-30- 36	24	11	36
14	10	24-30-36	28	10	36
14	11	24-30-36	30	10	36
14	12	20-24-30-36	36	9	36
14	13	24-30-36	40	8	40
14	14	30- 36 -44	60	6	90
16	10	30-36	60	6-7	80-90
16	12	30-36	60	7	80-90
16	13	30-36	60	7-8	70-80-90
16	14	30- 36 -40	62	6-7	90
18	7	24	62	7	80-90
18	8	24-30	64	6-7	90
18	9	24-30	64	7	80
18	10	30-36	64	7-8	80

Glue Joint Rip Saws

For New Mattison No. 202 and Yates G-2 and G-77 Machs.

Diam.	Gauge	Center Hole	Teeth	Fitting
12"	12	1½"	24	Swaged

For Mattison Old Style Machines No. 205 and No. 207

Diam.	Gauge	Center Hole	Teeth	Fitting
14"	12	1¼"	30	Swaged

Glue Joint Rip Saws (Continued)

For Diehl, Mershon, and Yates G-67 Machines

Diam.	Gauge	Center Hole	Pin Hole	Teeth	Fitting
14	12	2	1	36	Set and Filed

Cut-Off Saws

Diam.	Gauge	Teeth	Diam.	Gauge	Teeth
6"	18	100-120	22"	10	60
7	18	110	22	12	70
8	18	100-150	24	9	70
9	16	100	24	10	70-100
10	16	100-150	24	11	70
12	12	100	26	10	70
12	14	70- 100-150	28	10	70
14	13	80-100	30	8	70
14	14	60-80-	30	9	70
		100-150	30	10	70
16	12	60-80-100	32	10	70
16	13	60-80-	36	6	80
		100-150	36	8	80
16	14	60-80-	36	9	70
		100-150-200	38	8	80
18	10	80	40	6	80
18	12	60-80-100	40	7	80
18	13	60-80- 100	42	6	80
20	10	70	42	7	80
20	12	60-70	60	6	120
20	13	80			

Planer Saws

Diam.	Gauge	No. Sections	Diam.	Gauge	No. Sections
6"	16-19-16	12	12"	12-15-12	18
7	14-17-14	12	14	11-14-11	20
8	14-17-14	14	16	11-14-11	22
9	14-17-14	14	18	10-13-10	24
10	13-16-13	16	20	10-13-10	26

Smooth Trimmer Saws

For Hand Feed Cutting of
Dry Lumber

Diam.	Gauge	Teeth
8"	14-18-14	100
10	13-17-13	100
12	12-16-12	120-150
14	11-15-11	120-150-170
16	10-14-10	130
18	9-13-9	150
20	8-12-8	160
22	7-11-7	180
24	6-10-6	180

For Power Feed Cutting of
Dry Lumber

18"	8-12-8	150
20	8-12-8	160
22	7-11-7	180
24	6-10-6	180

For Power Feed Cutting of
Green Lumber

18"	8-13-8	90
20	7-12-7	100
22	6-11-6	100
24	6-11-6	120

Mitre Saws

Diam.	Gauge	Teeth
6"	16-19-16	150
7	16-19-16	150
8	15-18-15	150
10	14-17-14	150
12	13-16-13	150
14	12-15-12	200
16	12-15-12	200
18	11-14-11	200

No. 52 Flat Ground Combination Saws

Diam.	Gauge	No. Sec.
8"	18	16
9	16	16
10	16	18
12	14	20
14	14	22
16	13	24
18	11-12	26
20	9-12	28
22	8	30

No. 54 Flat Ground Combination Saws

Diam.	Gauge	No. Sec.
6"	18	12
7	18	12
8	18	14
9	16	14
10	16	16
12	14	18
14	13	20
16	13	22
18	12	24

No. 60 Flat Ground Combination Saws

Diam.	Gauge	Teeth
6"	18	44
7	18	44
8	18	44
9	16	44
10	16	44
12	14	44
14	13-14	44
16	13	44
18	12	44

No. 66 Plywood Combination Saws

Standard Stock Sizes — Made in 8", 10", 12", 14" and 16" diameters in one standard thickness and number of teeth per diameter, saws are available from stock with any desired size centerhole.

Dado Saws and Dado Fillers

All outside Dado Saws are $\frac{1}{8}$ inch thick. The fillers are $\frac{1}{16}$, $\frac{1}{8}$ and $\frac{1}{4}$ inch thick. Outside saws and all of the different thicknesses of fillers are carried in stock in the following diameters: 5, 6, 7, 8, 9, 10, 11, 12, 14, 16 and 18 inches.



Try **SIMONDS** Round Gullet Narrow Bands

for smooth fast cutting. A tough, edge-holding blade that stands up in the hardest work.

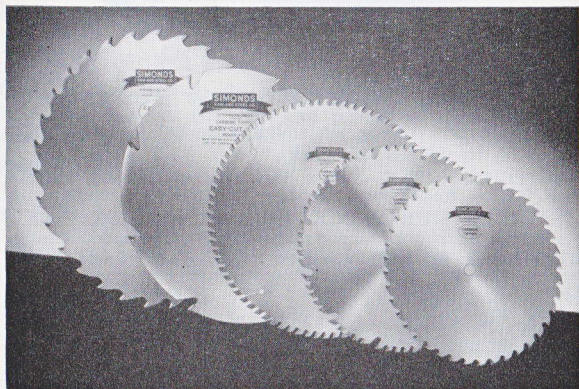
SPECIAL NOTICE—Narrow Band Saws are furnished *Set* and *Filed*, but not *Welded* unless specified.

SAWS IN OUR STOCK—Set and Filed—250' Coils

Width	Gauge	Teeth	Width	Gauge	Teeth	Width	Gauge	Teeth
$\frac{1}{8}$ "	25	6			5		21	2
$\frac{3}{16}$ "	21	3-4		25	5			3
	22	4			6			4
		5	$\frac{1}{2}$ "	20	2			5
		6			3		22	3
	25	5		21	2			4
		6			3		25	4
$\frac{1}{4}$ "	21	2			4			5
		3			5	1"	19	2
		4		22	3		20	2
		5			4			3
	22	4			5			4
		5		25	5		21	2
		6			6			3
	25	5	$\frac{5}{8}$ "	20	2			4
		6		21	2		22	4
$\frac{5}{16}$ "	21	3			3	$1\frac{1}{4}$ "	20	2
$\frac{3}{8}$ "	20	2			4			3
	21	2		22	4	$1\frac{1}{2}$ "	20	1
		3		25	5			2
		4	$\frac{3}{4}$ "	19	2			3
		5		20	2	$1\frac{3}{4}$ "	20	1
	22	4			3			2



CARBIDE TIPPED SAWS



STOCK SIZES

	<i>Diameter</i>	<i>Gauge</i>	<i>No. Teeth</i>
RIP	10"	12	24
	12	11	30
	14	10	30
	16	10	30
	18	9	30
CUT-OFF	8"	14	40
	10	13	40-60
	12	12	40-80
	14	11	40-80
	16	11	40-100
	18	10	60-100
Hand Feed — Comb.			
EASY-CUT	*5 $\frac{7}{8}$ "	14	8
	6	14	8
	†6 $\frac{1}{8}$	14	8
	6 $\frac{1}{2}$	14	8

STOCK SIZES (cont.)

<i>Diameter</i>		<i>Gauge</i>	<i>No. Teeth</i>
Hand Feed—Comb. (cont.)			
	7	14	8
	8	14	8
	9	14	8
EASY- CUT	10	13	8
	12	13	12
	14	12	12
	16	12	12
Power Feed — Rip			
	12	11	12
	14	10	12
	16	10	12
NO. 60 COMB.			
	*5 $\frac{7}{8}$ "	14	16
	6	14	16
	7	14	16
	8	14	18
	9	14	20
	10	13	20
	12	13	20
NO. 40 RADIAL ARM			
	9"	14	24
	10	13	24
	12	13	30
	14	12	36
	16	11	42

NO. 55 GENERAL PURPOSE 8" — 9" — 10" — 12" — 14" — 16" — 18".

<i>Diameter</i>		<i>Gauge</i>	<i>No. Teeth</i>
PLASTIC CUTTING			
	8"	13	40-48-70
	10	12	40-60-80
	12	11	40-60-80
	14	10	40-60-80
	16	10	40-60-80

THIN RIM PLASTIC CUTTING

<i>Diameter</i>	<i>Gauge</i>	<i>No. Teeth</i>	<i>Collar Dia.</i>	<i>Kerf</i>
8"	13	40-48-70	4"	.065 or .095
10	12	40-60-80	6	.065 or .095
12	11	60-80-100	8	.065 or .095

*Furnished with special centerhole for Skilsaw and Thor machines.

†Furnished with 1 $\frac{1}{8}$ " Round Centerhole only for Black & Decker machines.

Glue Joint Rip, Smooth Trimmer, Dado Heads and Groover Carbide Tipped Saws are furnished made to order.

"SI-CLONE"

THIN PLANER

KNIVES



Simonds Si-Clone Knives will run without jointing as much as twice as long as regular knives . . . produce a more uniformly smooth surface . . . give equally good results on all types of timber. Available from stock in all popular sizes.

THICK SLOTTED PLANER KNIVES



Simonds Slotted Planer Knives for square-head machines are made with either a High Speed Steel (Tungsweld) or a High Grade Tool Steel cutting edge welded to a tough steel back. This combination assures long wear and a toughness to resist shocks. Furnished in all standard sizes.

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FILES

*Best for
Sharpening
Saws*

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the Special

RED TANG
Narrow Band Saw
FILES

Simonds "Red Tang" line also
includes Rasps, Swiss Pattern Files,
Milled-Curved Tooth Files, Rotary Files
and Carbide Burrs.

NOTES

SAWS • KNIVES • SHEARS GRINDING WHEELS • FILES

Orders for or inquiries regarding Simonds Products may be addressed to any of our offices listed below. Your communications will be given immediate attention by that office or will be promptly referred to the proper sales office for such attention,

The logo consists of a red banner with the word "SIMONDS" in large, bold, white capital letters. Below it, in smaller white capital letters, is "SAW AND STEEL CO.".

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SAW AND STEEL CO.

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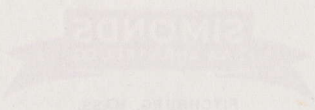
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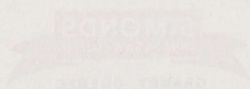
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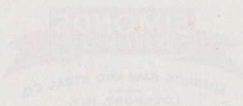
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